AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 5, 1955

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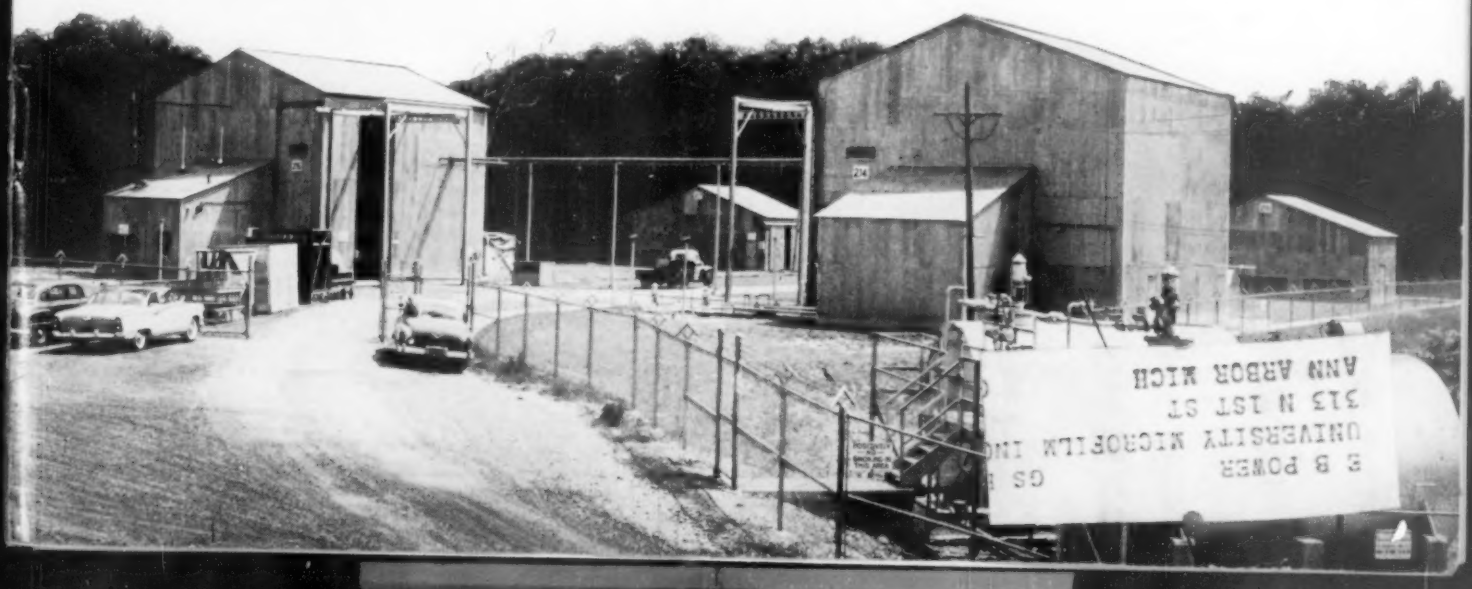
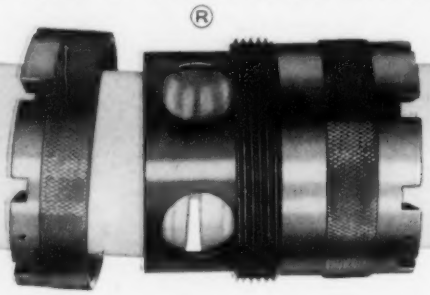


WIG-O-FLEX COUPLING ®



flexible union for connecting rigid tubes.

are you interested in weight reduction?

WIG-O-FLEX COUPLING SAVES 17 POUNDS on B-66B

The New Douglas B-66B Bomber is 17 pounds lighter because WIG-O-FLEX Couplings replaced standard AN Connections and cut hose. The WIG-O-FLEX Coupling weighs 1/5 as much as the standard AN connection it can replace. (See weight chart for exact comparisons.)

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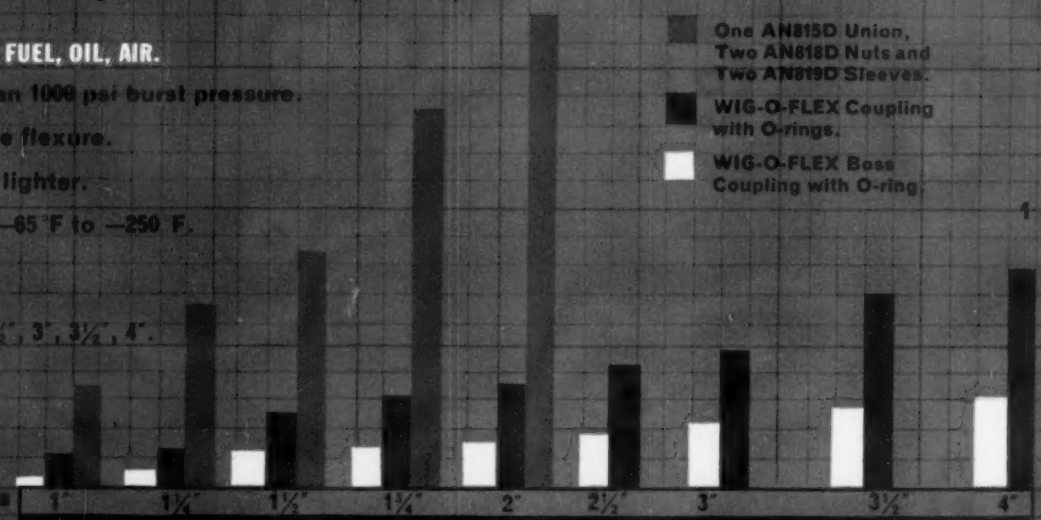
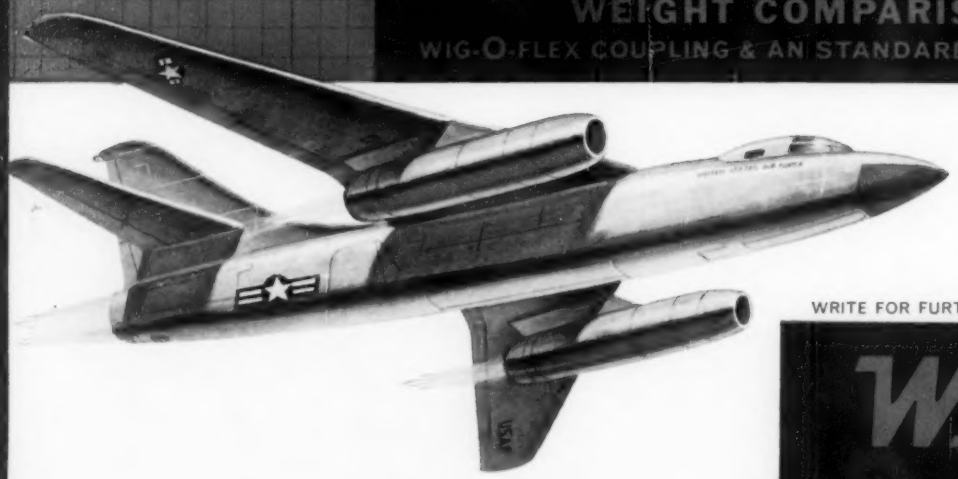


WEIGHT COMPARISON CHART

WIG-O-FLEX COUPLING & AN STANDARD FLARED TUBE CONNECTION



WRITE FOR FURTHER INFORMATION.

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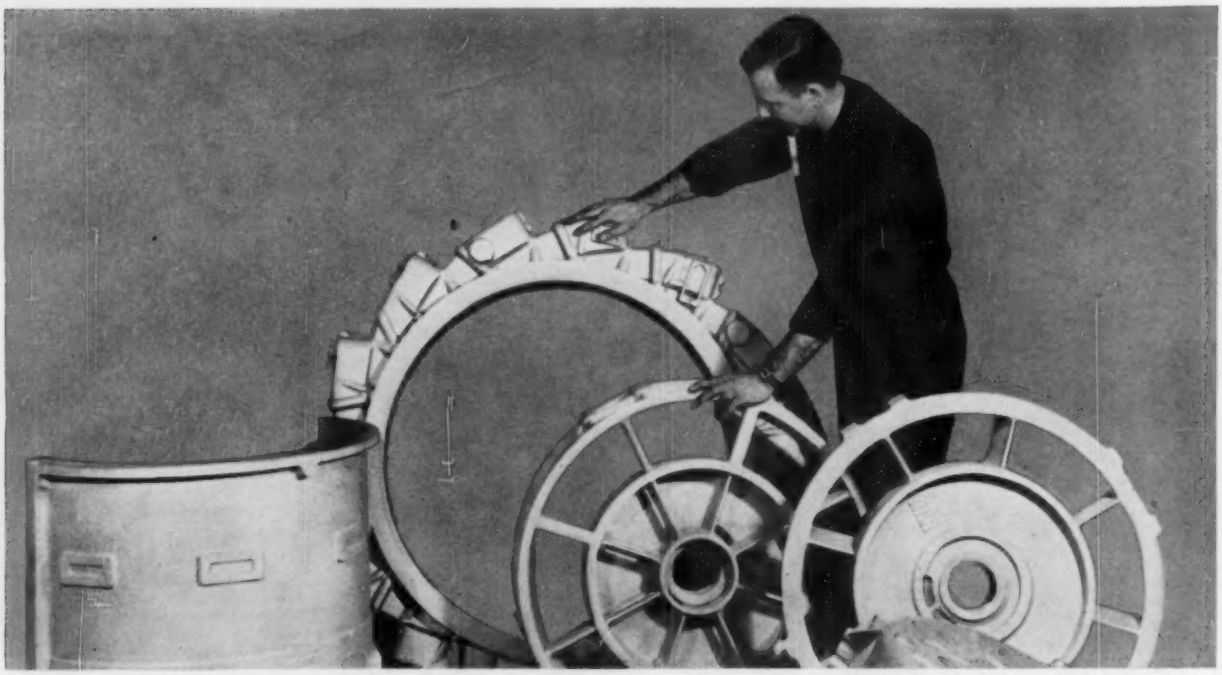

Lighter, yet more rigid castings! That's the big advantage of magnesium in sand and permanent mold castings.

By increasing section thickness and adding stiffening ribs, greater rigidity is possible. And because of magnesium's high strength to weight ratio, total weight can be cut.

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For further information on the advantages of magnesium, contact your nearest Dow sales office or write THE DOW CHEMICAL COMPANY, *Magnesium Department*, Midland, Michigan.

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DOW

DECEMBER 5, 1955

AVIATION WEEK

VOL. 63, NO. 23

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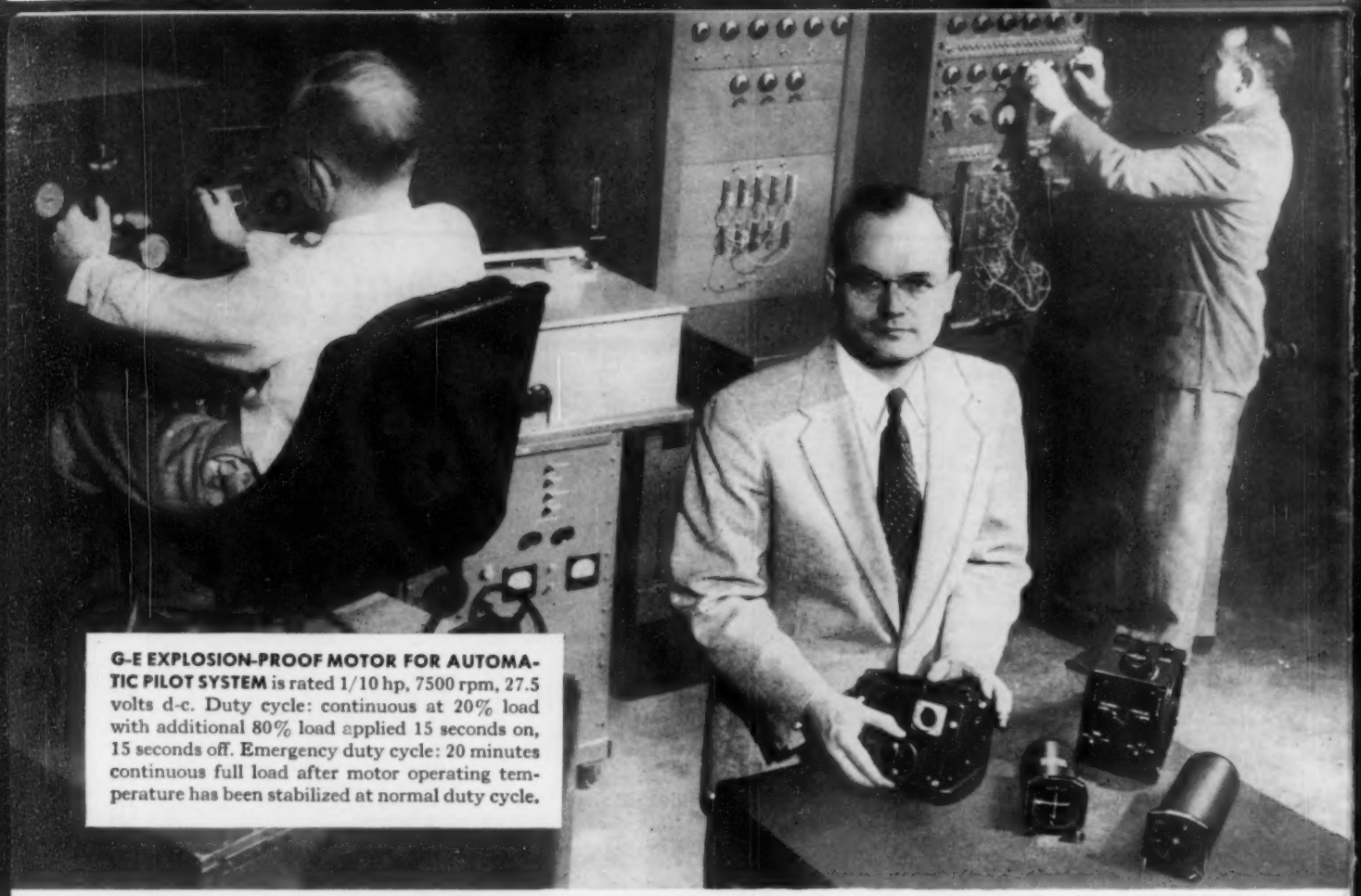

G-E EXPLOSION-PROOF MOTOR FOR AUTOMATIC PILOT SYSTEM is rated 1/10 hp, 7500 rpm, 27.5 volts d-c. Duty cycle: continuous at 20% load with additional 80% load applied 15 seconds on, 15 seconds off. Emergency duty cycle: 20 minutes continuous full load after motor operating temperature has been stabilized at normal duty cycle.

G-E aircraft motor specialists help solve drive problem on new Collins automatic pilot

E. H. Fritze, Controls Engineer, Collins Radio Co. (pictured above) says: "In the development of a new automatic pilot system, we were faced with an electric-drive problem. When two other suppliers failed to meet our requirements, we called in General Electric.

"In conferences between our engineers and G-E aircraft-motor specialists brought in by our local G-E Sales Engineer, we arrived at a solution to our problem. Sample motors were delivered in three weeks, saving us considerable engineering time and expense. We find service like this very valuable," Mr. Fritze concludes.

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If you have a development that calls for an aircraft or armament motor, the same fast, effective service provided the Collins Radio Company can be yours from General Electric. Just contact your local G-E Apparatus Sales Office early in your planning. Or write giving full details to Section 704–57, General Electric Company, Schenectady, N. Y.

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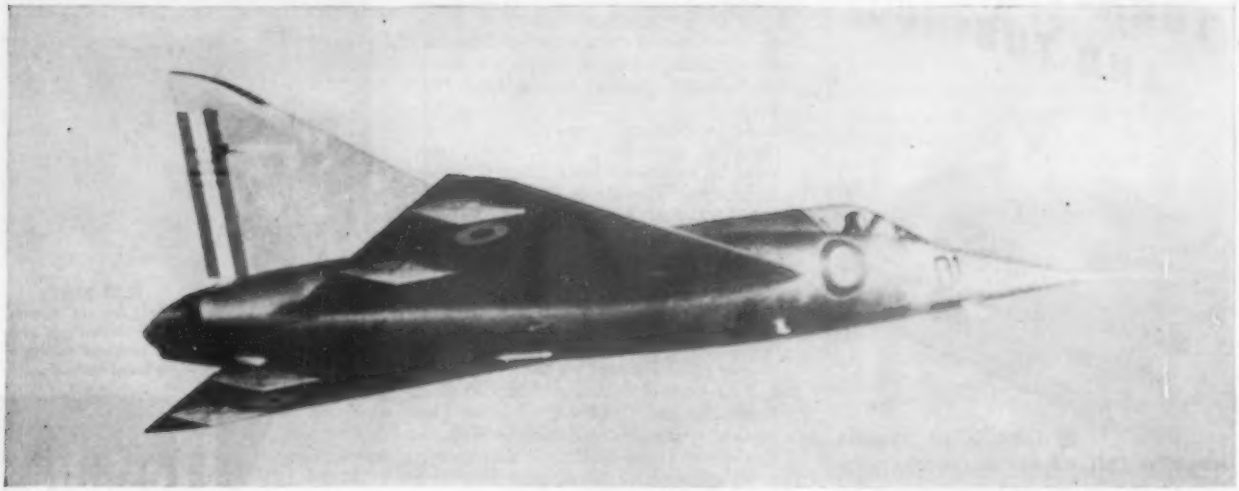
NEWS DIGEST



Dassault 550

Dassault 550 delta-winged interceptor prototype is shown under flight evaluation for the French air force. Powerplant of the 550 is mixed, combining a pair of Dassault-built Armstrong Siddeley Vipers and a single liquid-propellant rocket, probably built by SEPR. Plane has flown at supersonic speeds. Fuselage layout is almost identical to that of the Mystere 22 series under development for NATO and the FAF. Delta wing is extremely thin, uses much integral stiffening. Armament will be air-to-air rockets and a pair of 30-mm. cannon.

Domestic

Lockheed Aircraft Corp. will use stainless steel airframe components in its forthcoming 1649 Super Constellation. Solar Aircraft Co. said it had received a "several-million-dollar" order for the manufacture of the components, including nacelle barrels, landing-gear doors, fairings and access doors.

First powered flight of the Bell X-2 was made at Edwards AFB, Calif. Pilot for the flight was Lt. Col. F. A. (Pete) Everest. The X-2 was dropped from a B-50 and flew under power for approximately six minutes, attaining transonic speeds.

Bendix Aviation Corp. concluded its first radar sales to a foreign airline with purchases by both KLM Royal Dutch Airlines and Alitalia. KLM will install the weather-mapping units on its entire DC-7 fleet; Alitalia on DC-6s used over its southern European-South American routes.

Beech Aircraft Corp. received a $1 million training-plane order from the Chilean air force. Included in the order, the second within a year, were T-34 Mentor primary trainers and twin-engine Model 18 trainer-transports. Deliveries begin in February.

Dr. Edward Chester Creutz, director of the Nuclear Research Center at the Carnegie Institute of Technology, was named director of research of the General Atomic Division of General Dynamics Corp. As such, Dr. Creutz will head the work of the division's laboratory for pure and applied science. He also will continue, for the time being, his duties as scientists-at-large with the Atomic Energy Commission for Project Sherwood.

Andre A. Priester, sixty-four, vice president of Pan American World Airways, died of a heart ailment in Paris where he was presiding over a meeting of the International Air Transport Association's Technical Committee.

Sabena Belgian Airlines, pioneer European helicopter operator, purchased eight Sikorsky S-58 helicopters with delivery starting in the spring of 1956 (AW Oct. 24, p. 12). Sabena now operates six S-55s. Okanagan Helicopters, Ltd., a major Canadian operator of helicopters, also bought an S-58.

AiResearch Manufacturing Co., of Phoenix, Ariz., was awarded a $5,293,-038 Air Force contract to produce pneumatic starters for turbojet engines.

Financial

Capital Airlines declared a 5% stock dividend payable Dec. 28 to holders of record as of Dec. 13. A similar 5% stock dividend was made at this time last year.

McDonnell Aircraft Corp. declared a quarterly dividend of 12½ cents per share of common stock and a 3% stock dividend payable Jan. 1 to shareholders of record as of Dec. 16.

Solar Aircraft Co. net profits for the six months ending Oct. 31 were $603,-434 (88 cents a common share) as compared with $411,600 for the same period last year. Sales totaled $25,431,899.

Northrop Aircraft, Inc., declared a quarterly dividend of 40 cents a share on capital stock, payable Dec. 12 to stockholders of record on Nov. 28.

Foreign

Aeroflot, Russia's state-owned airline, signed an interline agreement with British European Airways for connecting flights between London and the Soviet Union beginning in April. Under the agreement, B.E.A. will extend its Scandinavian service to Helsinki for a northern connection with Aeroflot. The two airlines also will connect at Vienna. The Russians turned down a British plan for direct London-Moscow flights.

New Zealand National Airlines ordered three Vickers Viscount 800s, bringing the total number of Viscounts on order or in service to 242, 39 of which are 800s.

First 70 F-86 Sabre jets to be produced by Mitsubishi Heavy-Industries Reorganized, Ltd., in Nagoya, Japan, will be assembled from parts manufactured by North American Aviation, Inc., under a contract with the U. S. Government. North American also will furnish tooling and spare parts for the first Sabre jets, which Mitsubishi will produce under a license and assistance agreement with the U. S. firm.

TURKEY . . . AND TUBING!

■ There is no "holiday season" at TMI. Around the calendar, we're meeting and beating rigid specifications for straightness, finish, close tolerance and special shaping in cold drawn stainless and alloy tubing that "talks turkey" in no uncertain terms. We've carved ourselves a position of respect and responsibility.

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AVIATION CALENDAR

Dec. 7-9—National Association of Manufacturers, 60th Annual Congress of American Industry, Waldorf-Astoria Hotel, New York.

Dec. 12-16—Nuclear Engineering & Science Congress & Atomic Exposition, sponsored by Engineers Joint Council, Public Auditorium, Cleveland, Ohio.

Dec. 15-17—Fall Meeting, USA National Committee, URSI (International Radio Scientific Union), University of Florida, Gainesville, Fla.

Dec. 17—Nineteenth Wright Brothers Lecture, U. S. Chamber of Commerce Bldg. Auditorium, Wash., D. C. Wright Day Dinner at Sheraton Park Hotel.

Jan. 9-10—Second National Symposium on Reliability and Quality Control in Electronics, sponsored by Institute of Radio Engineers, Hotel Statler, Washington.

Jan. 9-13—Society of Automotive Engineers, Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

Jan. 19-21—National Simulation Conference sponsored by Dallas-Fort Worth Chapter of Institute of Radio Engineers' Group on Electronic Computers, Dallas, Tex.

Jan. 23-26—Institute of the Aeronautical Sciences, 24th annual meeting, Sheraton-Astor Hotel, New York, N. Y. Jan. 23—Honors Night Dinner.

Jan. 23-26—Plant Maintenance & Engineering Show and Conference, Convention Hall, Philadelphia.

Feb. 2-3—National Symposium on Microwave Techniques, sponsored by Institute of Radio Engineers' Antenna & Propagation Group and Theory & Techniques Group, Philadelphia.

Feb. 7-9—Society of the Plastics Industry, 11th annual Reinforced Plastics Div., conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

Mar. 19-21—Society of Automotive Engineers, national production meeting and forum, Hotel Statler, Cleveland, Ohio.

Apr. 9-12—Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York, N. Y.

Apr. 22-26—American Association of Airport Executives, 29th annual convention, Hotel Carter, Cleveland, Ohio.

May 2—Society of Aeronautical Weight Engineers, 14th annual conference, Fort Worth, Tex.

May 14-17—First Design Engineering Show, Convention Hall, Philadelphia. Managed by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

June 3-8—Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 11-15—Society of the Plastics Industry, Seventh National Plastics Exposition, New Coliseum, New York, N. Y.

June 17-21—American Society of Mechanical Engineers, semi-annual meeting, Hotel Statler, Cleveland, Ohio.

June 17-22—American Society for Testing Materials, 59th annual meeting and 12th apparatus exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 19—The Council of the International Civil Aviation Organization, tenth session, Caracas, Venezuela.

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WHO'S WHERE

In the Front Office

J. C. Garrett, founder of the Garrett Corp., board chairman. **W. C. Whitehead,** executive vice president, president of the firm.

James E. Lee has been promoted to executive vice president of United Aircraft Export Corp. **Robert B. Muir** and **Harvey Jolly** have been appointed vice presidents.

Russell B. McNeill, vice president-administration, Houdaille Industries, Inc., Buffalo, N. Y. formerly administrative assistant to Houdaille's president, he is a special consultant to USAF in logistics.

Maj. Gen. James McCormack, Jr., (USAF ret.), special advisor to president of Massachusetts Institute of Technology, formerly director of research and development, Deputy Chief of Staff (Development), Washington, D. C.

Stephen J. Nesbitt, assistant to president of Flight Equipment & Engineering Corp., Miami, Fla. He remains in the firm's Washington, D. C. offices.

Honors and Elections

Dr. Noah S. Davis, president, American Rocket Society. He is manager of special products department, Becco Chemical Division, Food Machinery & Chemical Corp., Buffalo, N. Y., specializing in concentrated hydrogen peroxide for military use.

George T. Hayes, chairman, aviation division executive committee, American Society of Mechanical Engineers. He is Washington office manager, Stanford Research Institute.

Everett M. Hicks, member of the Machine Tool Manufacturers Industry Advisory Council, Business & Defense Services Administration, U. S. Department of Commerce. He is vice president-manager, Grinding Machine Division, Norton Co., Worcester, Mass.

Changes

J. A. R. Kay, general manager, A. V. Roe & Co., Ltd., Manchester, previously executive assistant managing director to Sir Roy Dobson.

Louis B. Zambon, engineering manager of General Electric Co.'s Aircraft Gas Turbine Division, Cincinnati, Ohio, where he will handle preliminary designs on new engines and all design of controls and accessories . . . **Arthur Cavanaugh,** manager, aviation and defense industries sales, Oklahoma City territory, GE's Southwestern district.

Art Cocagne, director of field engineering, Whittaker Gyro, Inc., Van Nuys, Calif.

A. Leslie Valder, sales manager-Scotland, British Overseas Airways Corp.

Alastair Thomson, commercial manager, Seaboard & Western Airlines.

Maj. Gen. Charles F. Born, (USAF ret.), service engineering director, Apparatus Division, Texas Instruments, Inc., Dallas, Tex., previously commander of Crew Training Air Force, Randolph AFB, Tex.

(Continued on page 118)

INDUSTRY OBSERVER

► A major re-organization in General Electric will combine all the company's diverse avionic-systems activities under the firm's Electronics Division, while splitting off radio-TV which has been placed in the company's Consumer Products Group. The Electronics Division, together with GE's Aircraft Gas Turbine and Atomic Products Divisions, will make up the new Electronics, Atomic and Defense Systems Group. The move is expected to strengthen GE's avionic systems capability, previously handicapped somewhat by the firm's earlier decentralization.

► Static testing and launching facilities for the Atlas missile are being built for Convair at Patrick AFB, Fla., by the Los Angeles firm of Daniel, Mann, Johnson and Mendenhall. Control blockhouse has a 25-ft. thick roof. The engineering company also designed North American Aviation's test facilities in the Santa Susana Mountains (AW Nov. 28, p. 16) and is working on a pilot facility at Inyokern for Navy use in developing solid propellants for rockets.

► Systems responsibility for Bomarc missile guidance and ground environment equipment has been relinquished by Boeing Airplane Co., and given to a New York consulting engineering firm, to enable Boeing to concentrate its efforts on the missile itself.

► Air Force Secretary Donald A. Quarles, as chairman of the Air Navigation Development Board, has called the three Vortac committee consultants back into service to evaluate the results of recent tests which indicate that interference between Tacan stations on the same or nearby frequencies may be more serious than originally anticipated.

► Two major East Coast avionics' firms are competing with several large airframe companies for a prime pilotless-aircraft contract. One of the firms has named a smaller company as its airframe sub-contractor.

► New approach to short-life missile stabilization or guidance is a coast-down gyro energized by miniature solid-propellant rocket jet reacting against buckets mounted on the gyro rim. Scheme being developed for the Army is a variation on torpedo gyros which use a spring for initial energizing.

► Bristol Aeroplane Co. may manufacture the Sycamore helicopter at its subsidiary MacDonald Bros. plant in Winnipeg, Canada, if an order for Sycamores comes through from the Royal Canadian Navy.

► Minimum safe life of the Viscount wing is now estimated at 30,000 hours compared with 10,000 hours for earlier models. Improvement is due to strengthened spar booms and a different alloy in the bottom boom.

► Advanced development version of the Olympus engine design is running on the test beds at Bristol Aeroplane Co. at 18,000 lb. thrust.

► Douglas and Boeing engineers are now in England checking the Olympus and Conway engines as possible transport aircraft powerplants.

► One major reason behind shelving of the Vickers 1000 long-range transport was runway length limitations on the airplane. Short runways and steep approaches at airports like Hong Kong today would have made operations from such fields marginal, if not impossible.

► Look for de Havilland sales pitch for Comet 4 to be built around short takeoff and landing performance of the plane as compared to runway lengths required for Boeing 707 and Douglas DC-8.

► Titanium Metals Corp. has reduced titanium sponge prices from $3.75 to $3.45 per pound. Mill products reductions range from 60 cents to $3 per pound.

► Convair has developed a new cargo-passenger version of the Metropolitan 440. The new version will have heavier floors and 10-ft. doors to facilitate cargo loadings. The plane can be easily converted to all-cargo or all-passenger configuration or used as in a combination cargo-passenger configuration.

FRONTIERS UNLIMITED
Whittaker Gyro Inc., a completely reorganized facility, has been formed to exploit the combined skills and facilities of the Wm. R. Whittaker Co., Ltd. and the former Schwien Engineering Co.
With expanded research, test, and production facilities, Whittaker Gyro Inc. is now in a position to devote their established abilities to the solution of your problems.
Whittaker
GYRO, INC.
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STanley 7-5511

Washington Roundup

Machine Tool Wrangle

Blame for halting the reserve machine tool program is pinned on Secretary of the Treasury George Humphrey "and others primarily concerned with budget considerations" by Sen. John Sparkman (D.-Ala.), Chairman of the Senate Small Business Committee. "It is generally known that this decision was based on budgetary considerations," he said. "This cut is even more dangerous than reduction of military personnel in that it is a mistake more difficult to correct."

Protesting to Defense Secretary Charles E. Wilson, Sparkman pointed out that "as recently as Nov. 4, Secretary Pike (Thomas P. Pike, Assistant Secretary of Defense for Supply and Logistics) wrote me that this procurement program would help to increase the efficiency of our generally obsolete machine tool reserve."

Involved in the reported freeze of funds for machine tools is $50 million in Fiscal 1955 funds allocated to the Air Force, and $100 million in Fiscal 1956 funds for the three services. This spring, Defense Department testified before congressional committees that all Fiscal 1955 funds had been obligated and that the services were including in their Fiscal 1956 program "only tools for their highest priority end items." Urging approval of the $100 million fiscal program at the time, Pike testified that machine tool reserve "is a vital part of our over-all mobilization program and its omission now would, in case of emergency, seriously delay production of certain urgent military end items, especially in our aircraft and ship programs."

Rizley Backed

White House acted well in advance of the year-end deadline to re-appoint Ross Rizley chairman and Joseph P. Adams vice chairman of the Civil Aeronautics Board, quashing rumors of the pending departure of Chairman Rizley.

The early determination that current bipartisan management of CAB affairs will continue next year indicates White House approval of the way things have gone this year, including a trend on the part of a majority of the Board in favor of increased airline competition.

Red Tape

First step toward implementing a Hoover Commission recommendation for reducing paperwork burdens imposed on industry by the Government has been undertaken by the Advisory Council on Federal Reports, which reviews report forms and questionnaires for the Budget Bureau. The 22-member council has indicated an awareness of how Government paperwork besets the aviation industry with the establishment of new committees to work on problems of procurement, renegotiation and the airlines. Other areas that will also be explored soon include metal fabricating, plant and equipment reports, accident forms, and all paperwork involved in employment and tax matters.

Profits Investigation

Informal executive sessions of the House Armed Services Investigating Subcommittee with aircraft industry representatives are underway and will continue for at least another two weeks. They are preliminary to public hearings on Defense Department procurement policies on contracts with the aircraft industry. The subcommittee's aim: to find out whether profits have been excessive under these policies. The group is headed by Rep. Edward Hebert (D.-La.).

Jet Transports

U. S. manufacturers of turboprop and turbojet transports have been asked to incorporate military requirements in the design and production of commercial models. The request came from the Defense Air Transportation Administration, which wants airline jet purchases to fit immediately into Civil Reserve Air Fleet.

A preliminary meeting of representatives from Boeing, Douglas and Lockheed was held in Washington with Theodore Hardeen, Jr., DATA Administrator, to work out a program. Hardeen says it should be cheaper to first incorporate the craft's military requirements rather than undergo costly modifications later.

Carriers ordering jets may accept the DATA proposal in order to be eligible for rapid tax write-offs. At the present time, DATA has applications for fast write-offs in excess of a 300-aircraft limitation which are for piston-engine equipment as well as for recent jet orders.

Westinghouse J40

Senate Preparedness Investigating Subcommittee plans a thorough investigation of the J40 engine program of Westinghouse Electric Co. In addition to completing an investigation of the F3H Demon, built by McDonnell and powered with the J40, the subcommittee wants to ascertain the effects of the failures in the J40 program on other aircraft programs, costwise and otherwise. Navy originally planned powering the Douglas F4D and A3D and the Grumman F10F with the J40.

Air Controller Shift?

Study of federal manpower utilization being conducted by the House Post Office and Civil Service Committee includes a proposal to transfer air traffic controllers from the Civil Aeronautics Administration to the states or municipalities.

Bilateral Troubles

Toughest problem in the current tangle of bilateral air agreements has turned out to be with the British. More than a half-dozen deals are in progress including those with Belgium, Colombia, India, Japan and the Netherlands, but the most difficulty has been experienced with Great Britain.

Although there has been an exchange of notes since U. S.-British negotiators last met in June, there is no immediate prospect of any settlement on some of the more controversial items. These include authority for Tokyo-Hong Kong service by Northwest Airlines; approval of TWA's Frankfurt-Zurich service granted by Civil Aeronautics Board; entry of Pan American into Barbados; and a route segment for Delta Air Lines between Jamaica and Puerto Rico.

—Washington staff

AVIATION WEEK VOL. 63, NO. 23
DECEMBER 5, 1955

Fighter Speed-Up May Be Decelerated

Symington says pledged acceleration may be cut; USAF admits F-104 production is 'being reviewed.'

By Katherine Johnsen

Washington—Differences between the Administration and its Democratic critics on aircraft production plans to meet the threat of Russian airpower gains, smoldering since last summer, flared up last week.

Sen. Stuart Symington (D.-Mo.), a former Secretary of the Air Force who has led the Democratic opposition to the Administration's national defense policies, said that the speed-up of supersonic fighter production ordered by the Air Force may be dropped.

Symington will request the Senate Armed Services Committee, of which he is a member, to investigate any failure to follow through on the fighter program when Congress convenes.

Last June, the Air Force in a formal statement told the Senate Appropriations Committee that accelerated production had been decided upon for the McDonnell F-101 and the Lockheed F-104 (AW June 27, p. 12). This was the second repercussion following from the Moscow May Day aircraft show (AW May 23, p. 12). The first was a 35% boost in production of the Boeing B-52 long-range bomber, involving an additional appropriation of $206 million, which was enthusiastically voted by Congress.

Last week, the Air Force said:

- **The ordered acceleration** in the F-101B interceptor version "is continuing."
- **An acceleration in the F-101A** bomber escort version "was not included in the speed-up program." (USAF's statement to the Senate committee simply mentioned the F-101). A cutback in F-101A production is under consideration.
- **Ordered acceleration in F-104 production** is "being reviewed."

Industry sources reported, however, that a stretch out in the F-104 program appears certain.

'Deluded'

Addressing the Jefferson-Jackson Maryland State Dinner, Symington said:

"When the Congress and the press finally obtained from the Department of Defense a true evaluation of the new jet planes in the Moscow fly-overs of last spring, the department thereupon pledged the Congress to accelerate new fighter plane production, and the department added that no new money would be needed to step up the delivery of F-101s and F-104s—the two newest fighters." If supersonic fighter production is curtailed, he added, "the Congress will have been deluded along with the people."

Objecting to cutbacks in Army, Navy and Marine Corps program, as well as the Air Force, Symington charged that the Administration has impounded defense funds appropriated by Congress, delayed the release of money to be spent, set "secret" spending ceilings, and "most important, news of these actions was withheld from the people."

He called for a raising of the "the 'silent curtain' that this Administration has lowered over the dangers we face" from growing Soviet military strength.

He pointed out that shortly after taking office in 1953 the Administration first cut the Air Force program by $5 billion and then the Army and Navy programs by $2 billion, and that "in the ensuing two years the Army, Navy and Marines were reduced still further."

He said USAF "is growing but not nearly as rapidly, or as large, as orginally planned. It took two years of air parades over Moscow, plus strong congressional pressure, to force Administration action on a stepped-up air program."

Retaliatory Power 'Unequaled'

Meanwhile, Secretary of Defense Charles E. Wilson declared that the present "retaliatory power" of the armed forces "is unequalled in the world and we plan to keep it so." He said the Administration is pushing the development and production of new planes and guided missiles. In an address to the American Municipal Assn., he added.

"We could say, 'here is the amount of money that we should spend for security, and there will be no more.' If this were done, the military people would have to limit their forces accordingly. I don't favor this approach.

"The other extreme would be to say to the military people: 'What would you like to have—money is no object—what do you want?' I don't favor that approach either." He said the Administration aims at a balanced program between these two extremes.

Symington made these points:

- **"The Communists now have** more long-range jet bombers than we have.

U.S. Airpower Status Will Be Reviewed

The U. S. airpower position faces two major reviews when Congress meets.

The relative position of U. S. and Soviet power will be scrutinized by the Senate Disarmament Subcommittee established in the closing days of the last session. Headed by Sen. Hubert Humphrey (D.-Minn.), it includes top members of the Foreign Relations and Armed Services Committees, including Sen. Alben Barkley (D.-Ky.), Sen. William Knowland (R.-Calif.), Sen. Leverett Saltonstall (R.-Mass.), and Sen. Stuart Symington (D.-Mo.). Humphrey points out that it must be known how the U. S. stands defense-wise compared with the rest of the world before disarmament can even be considered. The subcommittee's staff is gathering facts.

The effect that failure to obligate Air Force funds for procurement will have on air power will be investigated by the Senate Appropriations Committee.

This spring the Senate wrote a directive into the Fiscal 1956 USAF budget that "funds . . . for aircraft and related procurement shall be obligated and expended as speedily as possible consistent with proven technological developments to the end that the U. S. shall not fall behind any nation in the world in air power."

In final congressional action, this was modified to a statement by the House and Senate conferees on the measure that they are "completely agreed that the build-up of Air Force . . . be accelerated to the extent possible consistent with proven technological developments and efficient application of appropriated funds."

Contract cancellations for aircraft procurement in the first quarter of Fiscal 1956 exceeded new obligations by more than $91 million.

Our own experts admit they can outproduce us now, and in the future, provided we follow our present production program, and they continue the rate of progress they have made to date."

• **Development of guided** and ballistic missiles has been on a casual basis. "For two years we dropped entirely the development of the now-acknowledged most important weapon in the whole missile field—the IBM. . . . Even now we are not making an all-out effort."

• **The "rather grim picture"** in the manned aircraft field is that "present production programs will barely sustain our current forces, much less keep them modern and superior."

• **Because of inadequate** operation funds, "Right now, in Korea, where our flyers should be ready to go at an instant's notice, our pilots can barely maintain proficiency in landings and take-offs."

• **"We must be ready** to meet any threats pertinent to commitments in the Far East, in the Near East, in Europe, and at home. But the over-all forces necessary are being progressively reduced in both size and effectiveness.

"Army garrisons in the Far East are being sliced to token forces.

"Even the new weapons we now possess cannot offset the almost total lack of friendly strength on the ground, all along the Asian fringe, from Formosa to Turkey."

Quarles Defends Air Force Policy

Los Angeles—Air Force Secretary Donald A. Quarles declared here last week that the USAF goal of 137 wings "is sound and will provide a force sufficient to deter Communist aggression."

Speaking to the Los Angeles Rotary Club at about the same time one of his predecessors, Sen. Stuart Symington (D.-Mo.), was denouncing Defense Department production plans and the Air Force's ability to meet Soviet aggression, Secretary Quarles expressed confidence that present planning, "steadily and intelligently adhered to, will see us through."

Quarles admitted that the Soviet Union leads the U. S. in airplane quantity but added that, "We are superior in the number and variety of atomic weapons and the aircraft required to deliver them." He had this to say about present U. S. aircraft:

• **B-58.** He described the Convair supersonic bomber as a forward-looking development. "We are very much interested in it, but will reserve judgment until we know more about it."

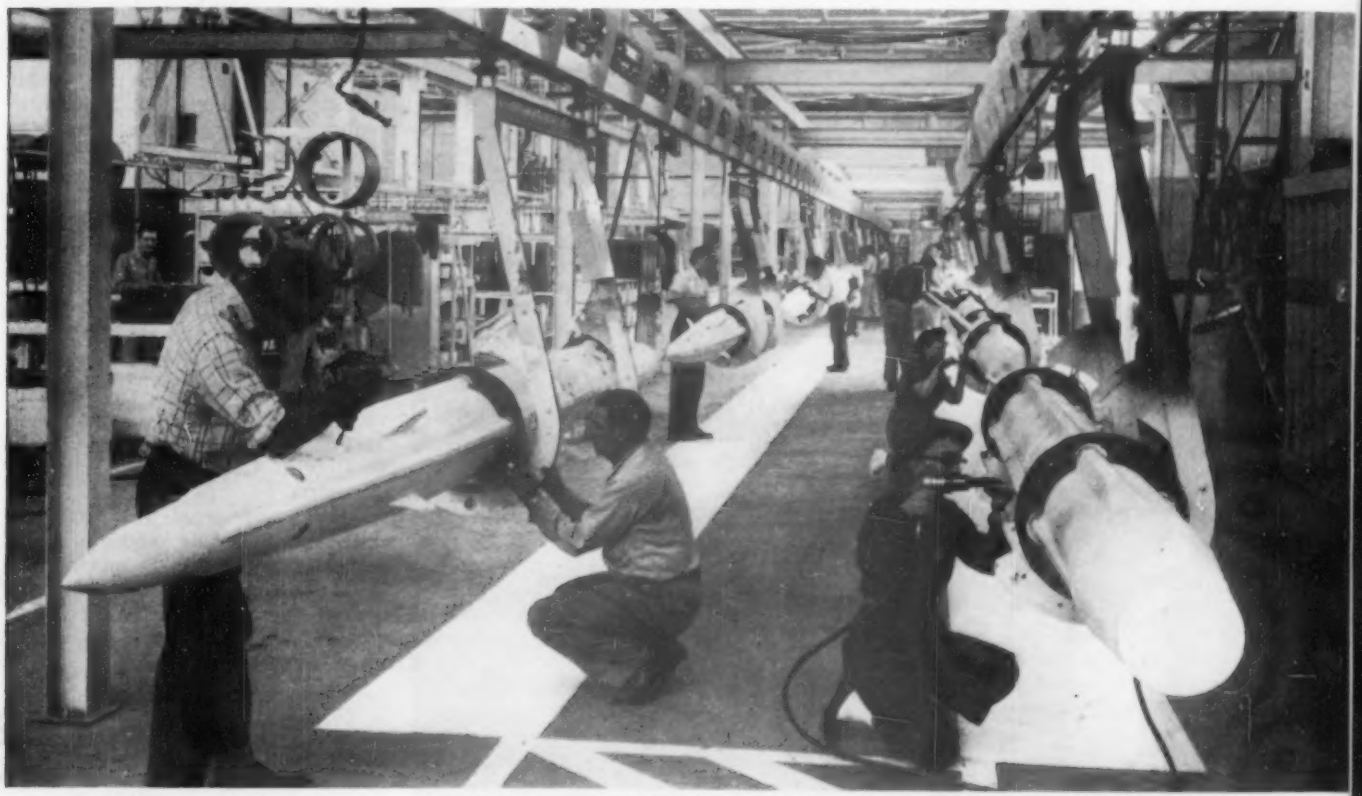
• **B-52.** "I regard the B-52 jet bomber as the most formidable expression of airpower in the history of military aviation. Its range, which can be augmented by refueling techniques, its bomb load, its highly skilled crews, coupled with electronic equipment which makes it possible for its crew to find and hit any target anywhere in the world in any weather, constitute a weapons system which no other nation can match."

• **B-47.** "We have so many B-47 jet bombers in operational use that we were able recently to stretch out our production rate."

Quarles warned, however, that a combination of strategic, defensive and tactical airpower can continue to be effective only by constant modernization to take full advantage of the products of research and engineering skills which must be maintained year after and as long as needed.

On another tack, he attempted to allay fears that Southern California aircraft and guided missile plants would be moved away from the state in line with the Defense Department's dispersal policy.

"I believe that this policy carries no threat to presently established aircraft plants," he said. "The aircraft and electronics facilities available here on the West Coast, and in particular the very important ones right here in Los Angeles, are indispensable to the maintenance and continuing development of airpower as we now know it and as we envision it for the future."



Nike Line

Overhead conveyor carries Nike through assembly line at Santa Monica Division, Douglas Aircraft Co. Nikes rest in rotating cradles for easy handling.

EIGHTEENTH AIR FORCE C-123S land "Friendly" forces on rough, unprepared Louisiana fields during Exercise Sagebrush . . .

C-123, H-21 Pass Maneuver Tests

By Claude Witze

Fort Polk, La.—The Fairchild C-123 assault transport and the Piasecki H-21 helicopter, two of the newer supporting weapons of the Air Force, are proving their versatility and ability under simulated combat conditions in Exercise Sagebrush.

Attached to the 18th Air Force, the C-123 and H-21 are being used primarily to help maintain the intra-theater airlift for Sagebrush, largest military maneuver to be held in the U.S. since World War II. Air operations in the exercise cover seven states.

Col. Jamie Gough, the 18th's Deputy Chief of Staff for Operations, told AVIATION WEEK: "We have come to believe firmly that every airlift plane needs to be all-purpose. If a plane is good for only one of our tasks, it is not the best possible investment for the Air Force. We feel that the C-123 can do all that the C-124 and C-119 can do, besides serving as an assault transport.

"Everybody wants a plane for his specific job. One of the things we learned in Korea and Indo-China was that this order can't be filled. We need all-purpose planes," he said.

First Mission Aborted

Prior to Sagebrush, the C-123 had been subjected only to single-plane tests. In its first assault run here, following a 2,000-man paratroop drop by Aggressor forces from C-119s, the new Fairchild twin-engine transports aborted their mission and turned back.

The reason was that the landing area was not cleared of airborne troops when the C-123s arrived at the drop zone. They were meeting "enemy" resistance and the Air Force control team ordered the pilots to return to England AFB.

In a repeat performance the following day, the mission was successful, but the aircraft did not land in the drop zone. They were cleared to land in a nearby area.

Col. Gough feels that valuable lessons were learned from this test. It may be, he says, that the assault transports should precede the paradrop or that they never should seek to land in the drop zone. The exact tactic, he feels, will be perfected before the 18th has taken delivery on many more of the new assault transports.

Here are some of Col. Gough's observations on the C-123:

- **Like the helicopter,** it has greater accuracy than the paradrop. It can put men, equipment or supplies right where they are wanted, terrain permitting.
- **It permits 100%** recovery of the men and goods in an assault operation; nothing is lost, injuries kept to a minimum, fragile equipment landed safely.
- **It can carry in some large items**—particularly guns—that cannot be dropped from present equipment.
- **It gives the airlift** operation more flexibility.

Sagebrush also is giving the 18th a chance to try this new aircraft on its medical evacuation mission.

Two air evacuation runs are scheduled daily within the maneuver area, with flight nurses and medics of the 18th's Aeromedical Evacuation Group loading and offloading the patients and caring for them in flight.

New Copter Utilization

Hundreds of actual maneuver casualties have been brought out of the simulated war zone on these runs. The C-123, Col. Gough points out, is able to operate out of short dirt strips near the front. Their use cuts down on long and tortuous ambulance rides. In a real war, they would save many lives, duplicating in many respects the job done during the Korean war.

Major handicap to the C-123 is that a few stumps or a bad ditch across a landing area can abort a mission or wreck the plane. It is not difficult for an enemy to spoil a landing place if he has time and proper demolition equipment.

Col. Gough says the 18th continues to learn of new utility from the H-21 helicopter. One of the activities that will be studied most closely in the final evaluation of Sagebrush will be the placement of USAF's 14-man Combat Control Team in the drop zone before the paratrooper invasion.

The group must be mobile, prepared to go along with Army units in the field, prepared to send information back to the Air Force, directing assault landings, equipment drops and fighter-bomber support when it is needed.

Early in the game it was learned that these units could not keep up with the action when they operated from trucks on the ground. Now the H-21s land the team, provide it with jeeps and trailer trucks, complete with communication equipment.

Night Airlift

USAF is confident that the H-21 is fast enough to do the job quickly, evading enemy action. Goal is to effect the first C-119 drop 20 minutes after the Combat Control Team leaves the helicopters.

Despite widespread talk that helicopter operations are seriously limited in darkness, the 18th is proving that the H-21 is not grounded outside of daylight hours. Crews have been conducting night practice that was put to use in Sagebrush.

Midway in the exercise, the U.S. or friendly Joint Operations Center had to be moved 90 miles from England AFB to Ruston, La. Thirteen H-21s did the job for all air-transportable equipment and did it at night.

To the 18th's commanders, this was

. . . **WHILE,** miles away, an "Aggressor" F-86H of the 312th Fighter-Bomber Wing delivers a simulated close-support attack.

an important test. The mission was performed with ease and the equipment set up for action before arrival of communications centers built into trailers.

Col. Gough said the 18th has available 72 Douglas C-124s, 128 Fairchild C-119s, nine Fairchild C-123s, 15 Sikorsky H-19s and 16 Piasecki H-21 helicopters.

Exercise Sagebrush is not providing the 18th with a test of a new concept of its mission in nuclear war. Maj. Gen. Chester E. McCarty, commander of the 18th, emphasizes the fact that Sagebrush is not interfering with regular world-wide operations. The 18th is meeting the demand for routine service to other countries as well as Army and Air Force intra-theater needs for Sagebrush.

"Actually," Gen. McCarty told AVIATION WEEK, "so far as the 18th is concerned, there is little difference between war and peace when it comes to the performance of our missions."

Sagebrush requires movement of personnel and supplies to support 140,000 men and more than 1,200 aircraft. Here are the 18th's missions:

- **Unit deployment.**
- **Airdrop supply operations.**
- **Airlanded supply operations.**
- **Scheduled airlift.**
- **Aeromedical evacuation.**
- **Airborne operations.**
- **Special airlift.**

Emergency Use

Not all of the soldiers and equipment are hauled into and around the Sagebrush theater by the 18th. Gen. McCarty takes a firm stand in favor of ground transport whenever it can be used. Airplanes, he says, are premium-priced carriers even for USAF and should be called upon only when their speed is essential.

"Airlift should not be used to replace ground transport because some supply

C-124 GLOBEMASTERS drop tons of supplies in first simulated combat drop with C-124s.

BULKY C-123 ASSAULT TRANSPORT lands at Fort Polk to pick up Sagebrush casualties.

officer failed to get his requisition in on time," he says. However, when there is a real emergency, such as a unit of troops that is cut off and in critical need of food, ammunition or medical supplies, Gen. McCarty waives all routine requirements.

The paperwork and channeling of the request through an Air Transportation Board is not necessary in these wartime crises.

After allowance for the scheduled airlift service and necessary training flights, which Gen. McCarty will not curtail during the maneuvers, there still are more than 300 daily flying hours to support Sagebrush. The time is calculated just as it would be in a shooting war—on the basis of aircraft utilization rates made possible by available gasoline and spares.

Sagebrush Airlines, the 18th scheduled flight service into the Louisiana area from bases all over the U.S. has been expanded to include a regular run from the Carolinas to Oklahoma and return, using C-124s.

The C-124 flights begin and terminate at the 63rd Troop Carrier Wing's home base at Donaldson AFB, S. C. They stop at Pope AFB, N. C., Stewart AFB, Tenn., and England and Lake Charles AFB in Louisiana, en route to Ardmore, Okla.

Most of the scheduled Sagebrush runs are made by C-119s of the 314th Troop Carrier Wing at Stewart AFB, Tenn., the 464th Troop Carrier Wing at Pope AFB, N. C., and the 463rd Troop Carrier Wing at Ardmore AFB, Okla.

The scheduled runs, used by both Army and Air Force, connect bases from Norfolk, Va., to Clovis, N. M., on time-table runs carrying mail, passengers and high-priority small-bulk cargo. All flights go into or out of the Sagebrush maneuver area.

Industry Is Warned On Critical Materials

Department of Defense warned last week that shortages of critical materials may force conservation of their uses in aircraft gas turbine engines.

Frank D. Newbury, Assistant Secretary of Defense for Applications Engineering, told a special joint industry-government conference that substantial conservation progress has been made but high stresses and temperatures in jet engines have led to unprecedented use of certain critical materials.

These materials, Newbury told the conference, are tungsten, molybdenum, nickel, chromium, cobalt and columbium.

Newbury noted that a Department of Defense instruction (4000.16) has been issued to provide a system of surveillance to show from year to year the status of these materials with respect to mobilization readiness.

An Air Force presentation cited important reductions in critical materials usage in jet engines resulting from its conservation program. Lt. Gen. C. S. Irvine, Deputy Chief of Staff for Materiel, said the average use of columbium, tungsten and cobalt has been reduced by 50%, nickel by 35%, and chromium by 5%.

These reductions were made possible, he said, by improved fabricating techniques and the use of alternate materials.

He warned industry, however, that in future aircraft the critical materials problem will be more serious as high stress and temperature will extend from the engine to the airframe.

USAF Heavy Press Program Completed

The heavy forging press program of the Air Force was completed when the fourth unit was put into operation recently at the Wyman-Gordon plant, North Grafton, Mass.

The Wyman-Gordon unit is a 50,000 ton press. The other 50,000 ton press is in operation at the Aluminum Company of America plant, Cleveland, Ohio. Two other forging presses, both 35,000 ton units, also are located at Alcoa and Wyman-Gordon.

The Air Materiel Command reports that its extrusion press program is expected to be completed in 1956. Six extrusion presses are scheduled in this program. Four are in operation. Two 8,000 ton units are in operation at the Kaiser plant, Halethorpe, Md. A 12,000 ton unit is operated at Curtiss-Wright, Buffalo, N. Y., and a 14,000 ton unit at Alcoa, Lafayette, Ind. An 8,000 and a 12,000 ton press are being set up at Harvey Aluminum, Los Angeles.

AMC said it expects substantial cost reductions through the use of the heavy press program. Parts being manufactured include bulkheads, engine mounts and fin and wing spars. Parts for the presses came from Japan, Italy, Scotland, England and France. Two extrusion presses were completely built in Germany.

Instrument Trainer

The Air Force has developed the first twin-jet basic instrument trainer for ground-based training under simulated flying conditions.

Manufactured by Link Aviation, and designated the ME-1, it is the first new basic trainer to be developed in five years, according to the Air Research and Development Command.

It has actual movement in roll and pitch, and only instrument indications in yaw. Previous trainers have had either actual movements in all three areas, or no movement at all.

As an improvement over the vague "whirring" sound of previous trainers, the ME-1 simulates actual engine, air and wheel sounds.

Martin to Build New Plant Near Denver

Baltimore—Plans for construction of a 500,000 sq. ft. facility near Denver, Colo., were announced last week by Glenn L. Martin Co., confirming Aviation Week's report (Nov. 14, p. 9).

The new plant, designated the Denver Division, presumably will be used to build a second intercontinental ballistic missile with a 5,000 mile range as a backstop to the Atlas IBM program. Martin officials would not say what type of weapon will be manufactured at the Denver Division.

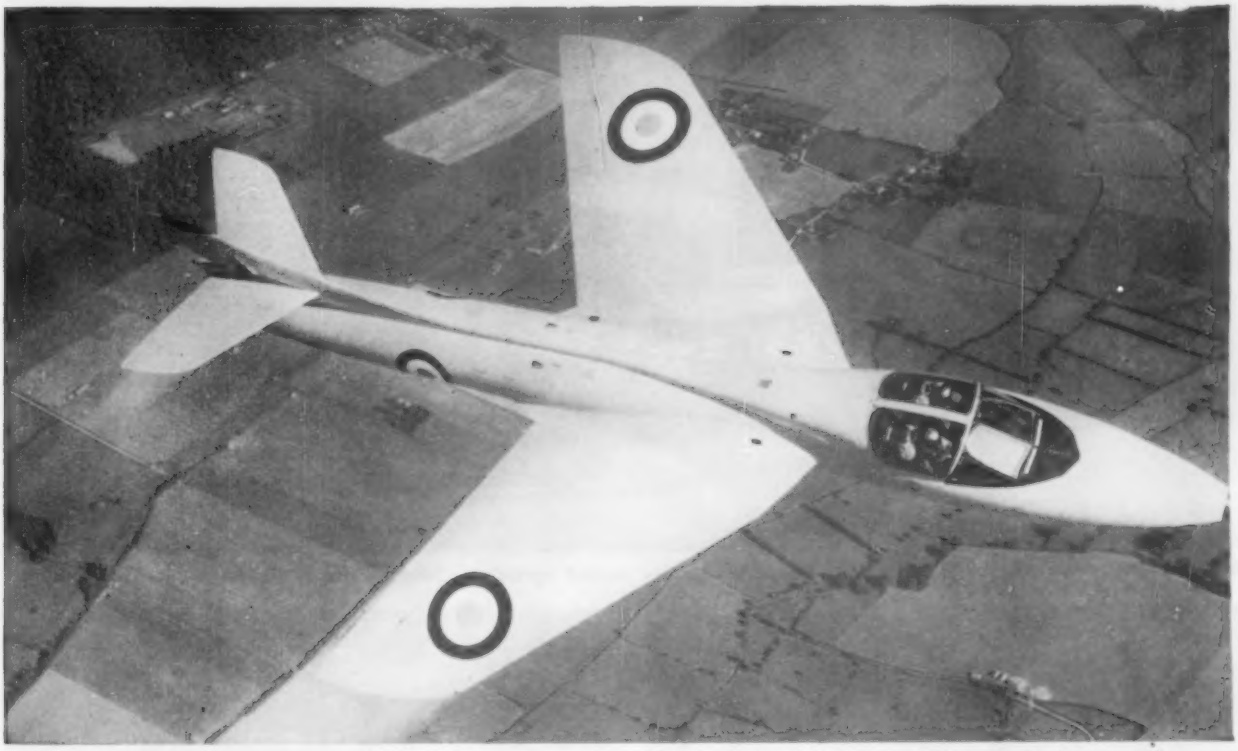
The Air Force said that no contract has been signed with Martin for production of an IBM at Martin's new Denver Division and refused to comment on whether negotiations were in progress.

Other Pentagon sources pointed out that the Denver location is in line with the Defense Department's recent dispersal directive (AW Nov. 28, p. 18) and that Martin would not go ahead with plans for a new plant without USAF assurances that a contract was forthcoming.

Martin has purchased a 4,000-acre site 15 miles south of Denver and construction will start within the next few months. The facility will be constructed with Martin funds. A minimum of 5,000 persons will be employed at the plant over the next four years.

Approximately 200 engineers and office staff are being moved immediately to temporary offices in downtown Denver. The staff will be augmented by personnel from its Middle River, Md., plant, but also will obtain large numbers of technical production personnel from the Denver area.

Martin officials said the move is not an expansion program. They said the plant is being established because of the availability of technical talent in that area and because they want to diversify their technical management structure.



Hunter Trainer Side-by-side trainer version of Hawker Hunter retains external lines of the fighter, with exception of bulgier cockpit. Armament is located in partial pods on bottom of fuselage.

Industry Faces Solid Labor Front In Impending AFL-CIO Merger

Los Angeles—With the CIO-AFL merger this month, the aircraft industry will face a united labor front at the bargaining table for the first time.

Previous efforts of the two unions to work together in the aircraft industry have failed, but it appears that, by the time negotiations open next year, a joint labor-union program will be ready.

A. C. McGraw, of the International Association of Machinists (AFL) told delegates to the recent National Aircraft Conference of the United Auto Workers (CIO) that planning already has begun.

"Last night," he said, "we had a chance to practice what we preach—members from the several Douglas plants—some of yours, and some of ours—met, they met jointly."

"Guess who is unhappy about the meeting? You don't need three guesses—Donald, Sr., and all his hired hands have been dreading the day we would get together."

The UAW-CIO also is pointing out to its members that the day has arrived, that the merger will mean greater success in aircraft bargaining. A CIO statement has declared:

"An important aspect of the overall collective bargaining problem in the aircraft industry is that union strength in relation to the industry is divided. The UAW-CIO and IAM-AFL represent by far the largest segments of the aircraft workers in the country. With the AFL-CIO merger on the threshold of realization, it becomes even more pertinent that both these great and progressive unions work hand in hand toward the consummation of common collective bargaining goals in the aircraft industry."

The UAW-CIO promises that the two rival unions will now coordinate their bargaining activities and present a solid front to the industry, thereby countering what the union calls the "enviable job" done by the industry in maintaining a solid front toward the unions.

"It is a source of gratification that meetings already undertaken with IAM representatives have proved of real value in setting the stage for coming negotiations," the union said.

AFL official McGraw told CIO delegates that planning already has been started on the various specifics of practical cooperation on a day-to-day basis.

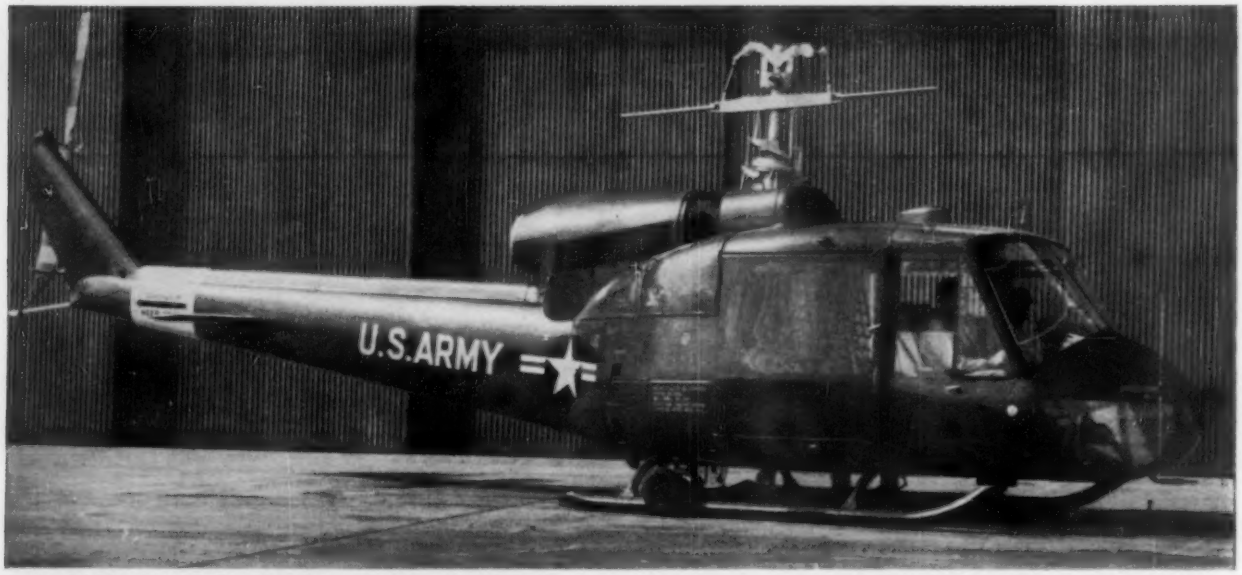
"It is (our) intention to translate the willingness to work together into affirmative and constructive action," he said.

Earlier, UAW-CIO vice president Leonard Woodcock outlined what the unions will seek in next year's negotiations (AW Nov. 28, p. 18). Now it is clear that coordinated action will be one of the keys to achieving these goals. It adds up to a much tougher job next year for aircraft industry negotiators.

V-1000 Specifications

London—Vickers-Armstrongs, Ltd., disappointed over the decision by the British Ministry of Supply cancelling orders for the V-1000 (AW Nov. 21, p. 9), reported the following performance figures for the jet transport:

- **Gross weight of 247,000 lb.**
- **Nonstop transatlantic payload of 21,600 lb.**
- **Range of 4,800 nautical miles.**
- **Speed of 440 knots carrying 100 first class passengers.**
- **V-1000 would have carried a 25,000 lb. payload on Commonwealth routes and would have been able to use all major airports on those routes. Vickers said the V-1000 project cost approximately $7,000,000.**



BELL XH-40 turbine-powered helicopter has low silhouette for combat operations. Model above is without main rotor blades.

CABIN holds two litter cases, pilot, medical attendant, co-pilot. Litters are loaded through sliding doors on either side.

HELICOPTER CAN BE TILTED backward by pump-down skid wheels enabling mechanics to make ground-level repairs.

Bell Turbine-Powered Helicopter To Have 15,000-Ft. Hover Ceiling

Bell Aircraft Corp. rolled out a full-scale mockup of its turbine-powered helicopter, the XH-40 last week. Winner of the Army's utility helicopter design competition, it has a purported climb potential equal to that of a World War II fighter. Among other features are:

• **In-flight blade tracking.** On present helicopters, adjustments must be made on the ground to track and trim rotor blades.

The XH-40 pilot will be able to make the necessary changes for smoother flying while in flight.

• **Light weight,** estimated at 35% below that of its counterparts.

• **Free-wheeling turbine engine** (the Lycoming XT-53) resulting in significant savings in weight, wear and maintenance time. Turbine engine also eliminates fans, spark plugs (a sore point in Korean-war helicopter operations) and reciprocating parts.

• **Flight period of 1,000-hr.** between overhauls as compared with the maximum time of 600 hr. for present helicopters.

• **Wide range of fuel.** The Lycoming XT-53 can operate efficiently on JP-4, all-purpose automotive, aviation fuel and kerosene.

Bell engineers say the single-rotor helicopter will have a vertical climb rate of 1,900 ft. per minute from sea level and approximately 15,000-ft. hovering ceiling out-of-ground effect on a standard day.

The out-of-ground effect hovering ceiling, they say, will be 7,000 ft. on a 95-degree day at gross weight.

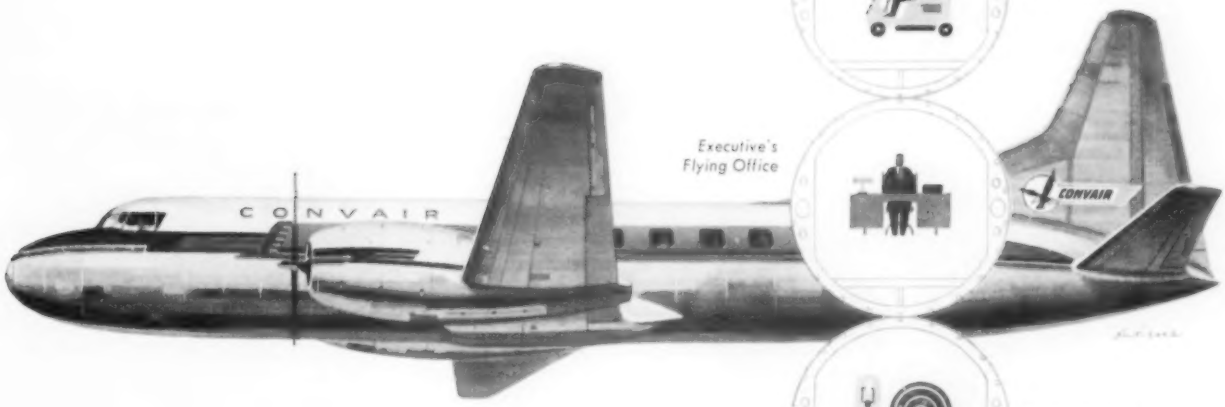
Range of the XH-40 is estimated at approximately 200 nautical mi. with full payload.

Bell says weight savings, through use of the turbine engine, will provide the XH-40 with a 100% increase in payload and a 43% increase in cruise speed over similar reciprocal engine-driven utility helicopters.

Another feature of the mockup are permanent work platforms and hoist mountings, built-in hub wrench and simplified structural breakdown for quick and easy field maintenance and repair.

After Army-suggested refinements in the helicopter are completed, Bell will construct three XH-40s for flight testing.

VERSATILITY...



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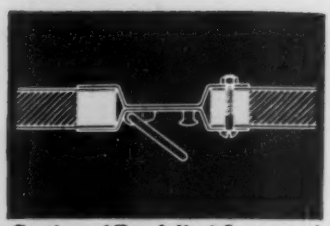
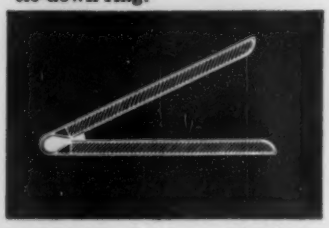
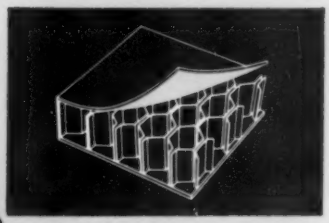
SOLVENT-FREE



Section of Bondolite® floor panel (®T. M. Goodyear Aircraft Corporation) with inserted cargo tie-down ring.



Wing flap section made from Bondolite. Bend is reinforced with Epon Adhesive VI.



Bondolite honeycomb construction. Epon Adhesive VI bonds aluminum skin to central aluminum honeycomb.

EPON® ADHESIVES?

New Epon adhesives are being specified to replace expensive riveting and welding in an ever-increasing variety of aircraft applications. Because they contain no solvents, Epon adhesives permit immediate assembly of metal-to-metal bonded parts. Contact pressure alone is all that is required to form sound bonds. Surfaces before bonding need not be machine-finished and glue lines need not be uniform. Air-relief drilling is never needed.

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- **EPON ADHESIVE 422: A special formulation in tape form for service at temperatures up to 500°F.**

Epon adhesives have been used successfully in bonding metal, plastics, rubber and wood for helicopter rotor blades, honeycomb wing sections, jet fuel tanks, radar antennae, structural joints and floor panels. Can Epon adhesives solve an assembly problem for you? Write us about your problem and we'll send full technical information and samples.

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Drop Tanks for Javelin

FAW. 1 Gloster Javelin was shown recently with close-fitting belly drop tanks (above). Picture also gives good view of cranked leading edge of wing, an aerodynamic fix that appeared after the flight testing of earlier production models.

Stock Transactions

Acquisition of $48,000 of 5½% debentures by Robert W. Prescott, officer and director of Flying Tiger Line, is reported in a survey of stock transactions by Securities and Exchange Commission covering Sept. 11 to Oct. 10. James E. Davidson, a director of the company disposed of 500 common shares and acquired $6,000 of 5½% debentures, making a holding of $12,000. Prescott's present holding of the 5½% debentures is $180,000.

Other recent transactions include:

Air Associates Inc. Acquisition of 900 common shares by C. Kenneth Baker, director, making a holding of 1,000.

American Airlines Inc. Disposal of 2,700 common shares by L. G. Fritz, officer, leaving a holding of 2,500; disposal of 1,500 common shares by William J. Hogan, officer, leaving a holding of 2,500; disposal of 500 common shares by P. G. Larie, officer, leaving a holding of 2,500.

Avco Manufacturing Corp. Disposal of 200 common shares by Parker H. Ericksen, officer, leaving a holding of 200.

California Eastern Aviation Inc. Acquisition of 1,100 capital shares and disposal of 3,000 capital shares by Jorge Carnicero, director and beneficiary, leaving a direct holding of 118,985 and an indirect holding of 37,422.

Capital Airlines Inc. Acquisition of 174 common shares by Raymond G. Lochiel, officer, making a holding of 8,385; disposal of 1,000 common shares by Thomas D. Neelands, Jr., director, leaving a holding of 4,825; acquisition of 500 common shares by Harold Byron Smith, director, making a holding of 1,027; disposal of $5,000 of 3½% convertible debentures by Raymond G. Lochiel, officer, leaving no holding.

Douglas Aircraft Co. Inc. Acquisition of 300 capital shares through exercise of option by M. A. Kavanaugh, officer, making a holding of 300.

Eastern Air Lines Inc. Acquisition of 100 common shares by Everett R. Cook, director, making a direct holding of 1,500 and an indirect holding of 306; acquisition of 5,000 common shares by Laurence S. Rockefeller, director, making a total holding of 85,000.

General Dynamics Corp. Disposal of 1,410 common shares by J. Geoffrey Notman, officer and director, leaving a holding of 1,000.

General Motors Corp. Disposal of 200 common shares by Paul Garrett, officer, leaving a holding of 1,656.

Goodyear Tire & Rubber Co. Acquisition of 22,124 common shares through exercise of option, by P. W. Litchfield, director, making a holding of 46,704; acquisition of 1,946 common shares through exercise of option by E. J. Thomas, officer and director, making a holding of 28,802.

Irving Air Chute Co. Inc. Acquisition of 2,000 class A common shares by Harold G. Rogers, officer and director, making a holding of 2,200.

Glenn L. Martin Co. Disposal of 1,500 common shares by George B. Shaw, officer, leaving a holding of 6,118; disposal of 200 common shares by G. S. Trimble, Jr., officer, leaving a holding of 2,000; disposal of 1,043 common shares by George T. Willey, officer, leaving a holding of 7,000.

Minneapolis-Honeywell Regulator Co. Disposal of 1,100 common shares by H. W. Sweatt, director, leaving a direct holding of 115,240 and an indirect holding of 7,030; disposal of 400 common shares by J. J. Wilson, officer and director, leaving a holding of 94,000.

National Airlines Inc. Acquisition of 600 common shares by R. E. Wieland, officer, making a holding of 2,608.

National Aviation Corp. Disposal of 300 common shares by Frederick F. Robinson, officer, leaving a holding of 400.

Pacific Northern Airlines. Disposal of 15,000 common shares by William E. Boeing, Jr., director, leaving a holding of 1,666; disposal of 12,000 common shares by A. G. Woodley, officer and director, leaving a holding of 262,661.

Philco Corp. Disposal of 2,900 common shares by Thomas A. Kennally, director, leaving a holding of 9,064; acquisition of 3,600 and disposal of 118 common shares by Philco Profit Sharing Plan, making a holding of 525,963; disposal of 100 common shares by Leslie J. Woods, officer and director, leaving a holding of 7,593.

Rohr Aircraft Corp. Acquisition of 200 common shares by S. W. Shepard, officer, making a holding of 5,800.

Ryan Aeronautical Co. Acquisition of 300 common shares by Emtor Inc., beneficiary, making a holding of 87,100.

Thompson Products, Inc. Disposal of 1,000 common shares by James H. Coolidge, officer and director, leaving a holding of 24,580; disposal of 600 common shares by M. E. Price, officer, leaving a holding of 1,794.

Trans World Airlines. Acquisition of 100 capital shares by John E. Bierwirth, director, making a holding of 100.

United Air Lines Inc. Acquisition of 2,500 common shares through exercise of option by R. F. Ahrens, officer, making a holding of 3,002; acquisition of 2,500 common shares through exercise of option by Curtis Barkes, officer, making a holding of 2,551; acquisition of 750 common shares by Rexford E. Bruno, officer, making a holding of 839; acquisition of 2,000 common shares through exercise of option by R. W. Ireland, officer, making a holding of 2,445; acquisition of 2,500 common shares through exercise of option and disposal of 50 common shares by R. E. Johnson, officer, making a holding of 3,000; acquisition of 5,000 common shares through exercise of option by Otis E. Kline, officer and director, making a holding of 9,000; acquisition of 2,000 common shares by Donald F. Magarrell, officer, making a holding of 3,000; acquisition of 750 common shares through exercise of option by S. P. Martin, officer, making a holding of 750; acquisition of 200 common shares through exercise of option by Vernon Stouffer, director, making a holding of 200.

Westinghouse Electric Co. Acquisition of 500 common shares by John M. Schiff, director, making a holding of 10,500.

1945 **WATCHFUL PEACE** 1955

The constant Peace and Serenity experienced throughout the vast reaches of our colourful land have not been disturbed in a decade that won for Canada expanded engineering resources and skills.

To help maintain that status, Avro Aircraft accepted the engineering and manufacturing responsibility of providing Canada with its first twin-jet military aircraft . . . a night and day, all-weather, long-range interceptor, unlike anything then in production in the world.

The responsibility has been fulfilled. Canada's Royal Canadian Air Force has been equipped with the Avro CF-100 in multi-squadron strength. Improvements and refinements maintain its rating as one of the most effective interceptors of this type in the world. And in 1956, CF-100's will start augmenting RCAF NATO squadrons in Europe.

As Canada's second decade of jetpowered aeronautical achievement gets under way, Avro Aircraft is undertaking the design and development of a new supersonic, all-weather interceptor, which will maintain Canada's leadership in producing this type of aircraft.

It's been a decade of progress in Canadian Aviation . . . contributing to a decade of Peace that gave Canada a worthy place in world aviation.

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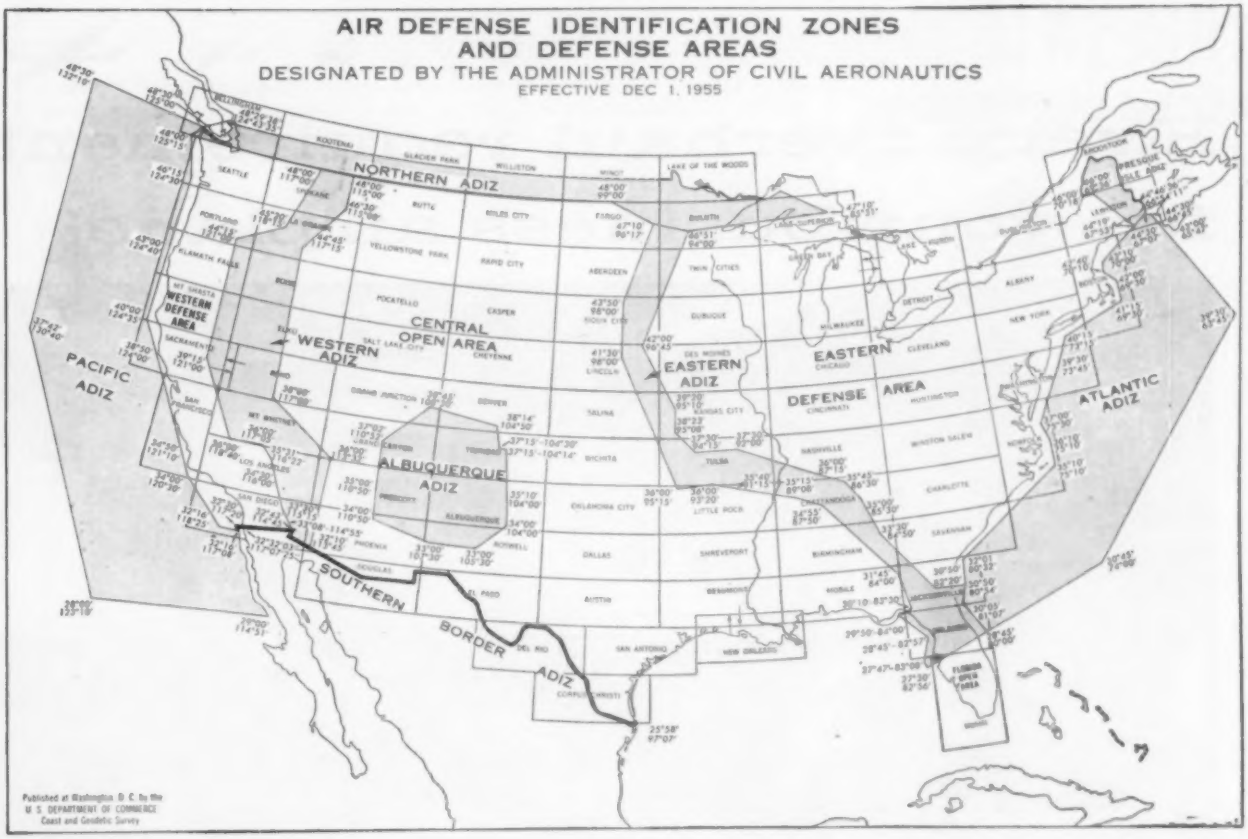
CELEBRATING 10 YEARS OF JETPOWERED AERONAUTICAL DEVELOPMENT IN CANADA



ADIZ Structure Altered by CAA

Major changes in the structure of the U. S. Air Defense Identification Zones (ADIZ) became effective Dec. 1 on orders of the Civil Aeronautics Administration. The ADIZ system channels information on civil flights through CAA to the Air Defense Command.

The structure changes in the ADIZ and in the operating rules are contained in Regulations of the Administrator, Part 620, "Security Control of Air Traffic."

Changes in the ADIZ from those established January 15, 1953, include a lengthening of the Atlantic Zone to the South; the establishment of a new eastern ADIZ running generally down the center of the country and swinging southeast to join the Atlantic Zone over Florida and the elimination of the Knoxville ADIZ.

The new structure also establishes a western ADIZ inland from the West Coast, abolishing what was formerly the Los Angeles, San Francisco and Seattle ADIZ. The Pacific ADIZ remains substantialy the same off the West Coast.

Along the northern border a new narrow Northern ADIZ replaces the Great Falls, Minneapolis and Travers City ADIZs and in the Southwest a new Southern Border ADIZ has been established along the Mexican border. The Albuquerque ADIZ remains virtually unchanged. In the extreme northeast a smaller Presque Isle ADIZ replaces the former Bangor ADIZ.

A chart of the new ADIZ is shown above. Copies are available from the CAA Office of Aviation Information, Washington 25, D. C.

Lockheed Sends Navy New Version of WV-2

Burbank, Calif.—Weather-reconnaissance versions of the Lockheed WV-2 radar picket planes are now being delivered to the Navy under the designation WV-3.

First of the WV-3s was delivered to Early Warning Squadron Four at the Jacksonville (Fla.) Naval Air Station. In addition to the electronic equipment carried by the WV-2 picket planes, WV-3s are equipped with highly-specialized meteorology instruments.

With the additional instruments, the WV-3 may be used either as a long-range radar picket aircraft or as a "hurricane-hunter."

New meteorology equipment includes a device known as "Ice Rate Meter" which instantly records the rate at which ice forms at various altitudes. This replaces former instruments that were limited to measuring ice thickness after it already had accumulated.

The aircraft also contains a rapid-action thermometer with a probe extending into the air stream. The probe is cooled automatically at the same rate at which air flowing against the thermometer would heat its surface, providing an adusted reading that reflects the true air temperature at the given altitudes.

The WV-3 also incorporates a small pressure chamber for use in releasing radio sonde balloons. This is somewhat similar to a submarine escape hatch. It enables weather balloons to be released from within the aircraft at altitude without depressurizing the main cabin.

USAF May Redesign C-124 for Air Drops

Donaldson AFB, S. C.—The 18th Air Force is studying possible redesign of the Douglas C-124 Globemaster to permit enlargement of the present elevator door for air dropping of heavy equipment.

The project originated with experiments carried out in planning for USAF's logistic support of Operation Deep Freeze, U. S. Navy Antarctic ex-

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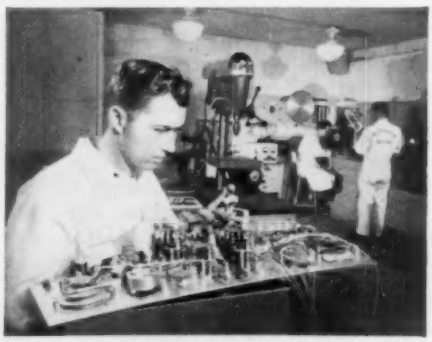

NEW RADIO AND ELECTRONICS CENTER has most complete facilities in the nation for business aircraft. CAA certified for Class I and II

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Aviation Gasoline

Here is the production, stocks and demands for aviation gasoline reported by the Bureau of Mines, Department of Interior, for August with cumulative statistics for the period of January through August 1955.

(Thousands of Barrels)

	August 1955	August 1954	January - August (Incl.) 1955	January - August (Incl.) 1954
Production: (By Grades)				
115/145	3,429	2,638	25,301	19,883
108/135	367	476	2,467	2,110
100/130	3,431	3,634	24,242	28,309
91/98	577	476	3,555	3,967
Other Grades	386	286	2,212	1,939
Alkylate	1,226	1,089	10,010	6,707
Stocks: (End of Month)				
By Grades:				
115/145	2,650	1,917	2,650	1,917
108/135	272	383	272	383
100/130	3,288	3,499	3,288	3,499
91/98	608	895	608	895
Other Grades	426	380	426	380
Alkylate	2,377	2,888	2,377	2,888
Domestic Demand:				
All Grades	6,182	5,665	45,705	42,908
Total Demand:				
By Grades:				
115/145	3,158	2,481	24,281	19,616
108/135	432	379	2,500	2,081
100/130	3,535	3,538	24,242	27,276
91/98	512	548	3,477	3,853
Other Grades	361	317	2,139	1,930
Alkylate	164	46	977	488

pedition in support of the International Geophysical Year.

In an early test last month near Davisville, R. I., a 12,700-lb. tractor was successfully dropped. Plans are under way to repeat the test this winter in Greenland or Colorado under temperature and altitude conditions similar to those in the Antarctic.

One of the major handicaps to use of the C-124 for parachuting equipment is the present elevator door, which is 159 by 93 inches in size. With the elevator removed, the 18th AF has designed a drop platform that can be triggered from the well. Larger and heavier items could be dropped if the doorway were enlarged.

For less bulky supplies, the aircraft is capable of dropping 20 tons in two minutes, packaged in one-ton bundles.

In preparation for the Antarctic expedition, eight fliers from the 18th AF already have left to study conditions on the icecap.

Veterans of the Dewline operation near the North Pole, the fliers will obtain data on weather, terrain and other conditions at the Pole Station.

In October 1956, C-124's of the 18th AF will airdrop buildings, tractors, equipment and supplies at the Pole Station. A total of about 500 tons will be hauled from McMurdo Sound, 750 nautical miles away.

Maintenance of the aircraft will be performed at a base in New Zealand, 2,000 miles from McMurdo Sound. Each plane will fly out of the Antarctic area for an overhaul after about eight trips over the ice cap.

United Air Lines Gets Certificate of Necessity

United Air Lines has been granted a certificate of necessity amounting to $23,519,301 for new aircraft by the Office of Defense Mobilization with 80% of the amount allowed for rapid amortization.

Other certificates include:

American Airlines, Inc., New York, air transportation, $9,552,395 certified with 80% allowed.

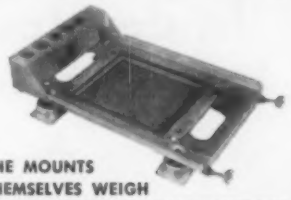
Lord Manufacturing Co., Erie, a., military aircraft parts, $88,860 certified with 70% allowed.

Kearfott Company Inc., Little Falls, N. J., military aircraft instruments, $57,668 certified with 65% allowed.

Joint Defense Exercise

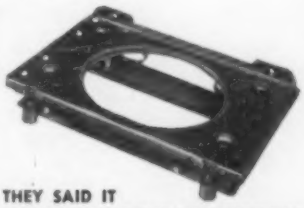
Joint air defense exercises will be held this winter by the United States and Canada. Radar tracking and interception by the air forces of both nations (including the USAF's Strategic Air Command) will be outstanding features of the exercises.

LIGHTWEIGHT
MOUNTING BASES



THE MOUNTS THEMSELVES WEIGH TWO OUNCES LESS THAN AVERAGE

FINNFLEX All-Metal Mounts meet *all* requirements of MIL-C-172-B and yet weigh two ounces less than average. On this base alone that means a half-pound savings!



THEY SAID IT COULDN'T BE DONE IN ALUMINUM

Previous aluminum models of this widely used base failed the shake and drop tests, and their makers were forced to use stainless. Finn designers, however, came up with an all-aluminum model that passed every test—is officially approved.

AND NOW... MAGNESIUM!

...25% lighter with no sacrifice in strength of performance. Finn magnesium bases are available in MIL-C-172-B standard sizes or in special designs.

Finn has the staff, the laboratory and the plant facilities to solve your toughest shock and vibration problem. "QPL", of course. Write for complete engineering bulletins and learn how you can cut both weight and costs with Finn-engineered vibration mounts and bases.

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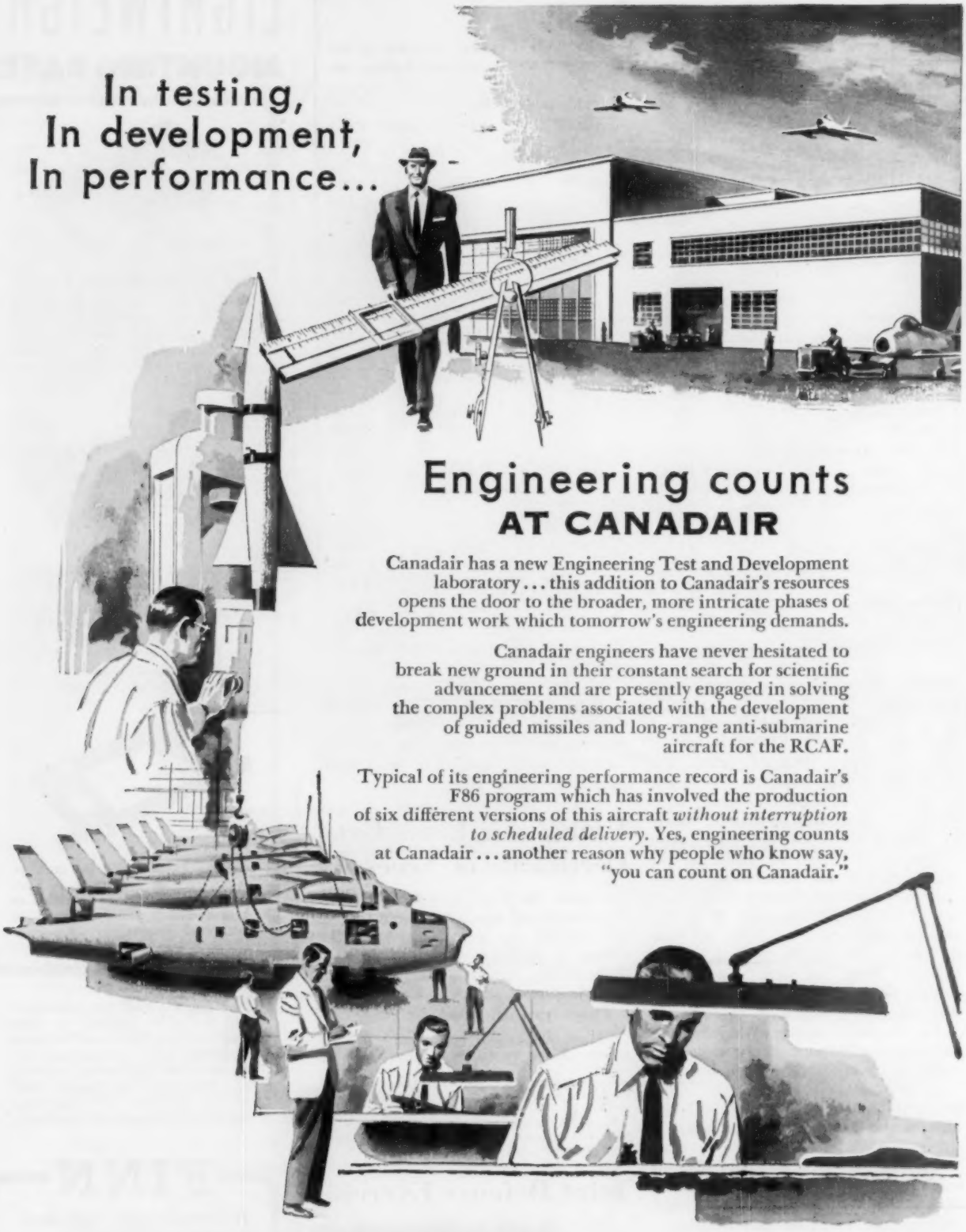

Engineering counts
AT CANADAIR

Canadair has a new Engineering Test and Development laboratory... this addition to Canadair's resources opens the door to the broader, more intricate phases of development work which tomorrow's engineering demands.

Canadair engineers have never hesitated to break new ground in their constant search for scientific advancement and are presently engaged in solving the complex problems associated with the development of guided missiles and long-range anti-submarine aircraft for the RCAF.

Typical of its engineering performance record is Canadair's F86 program which has involved the production of six different versions of this aircraft *without interruption to scheduled delivery*. Yes, engineering counts at Canadair... another reason why people who know say, "you can count on Canadair."

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CASS-YYUST

Coordinated Warfare

The role assigned to fixed and rotary-wing aircraft by the Marines in their concept of coordinated tactical warfare is dramatically illustrated above. In maneuvers at Quantico, Va., a flight of Sikorsky HRS helicopters ferry troops and cargo to the front at tree-top level under a smokescreen cover, while protecting jets fly overhead. Covering aircraft also can be diverted for close-support and reconnaissance missions as shown at right, where the pilot of low-flying jet is pinpointing enemy objectives for tank equipped with long-distance flame thrower.

Thermal Stability Of Jet Fuel Studied

The problem of aircraft fuel stability at high temperatures is becoming increasingly important as performance of new planes is pushed higher and higher.

In combating the so-called "thermal barrier" at supersonic speeds, designers are now thinking in terms of using fuel as a coolant for the lubricating oil, radar, hydraulic systems and air conditioning equipment. This, because systems using air as a coolant impose severe drag penalties at high speeds and the boundary air is heated by friction and compression to such an extent that it can not be used as an effective coolant.

Fuels presently specified for jet performance, however, are thermally unstable at supersonic speeds—the heat breaks the fuel down, causing formation of insoluble sediment which clogs fuel systems and causes critical reductions in flow. This not only restricts their use as a "heat sink" (coolant) but imposes operational limits on gas turbine engines and may prevent designers from taking advantage of maximum engine power and efficiency.

Scientists of Esso Research and Engineering Co. say the problem could be solved by aircraft and/or engine design, but the addition of extraneous cooling and insulating systems brings with it weight penalties and impaired aircraft performance.

Another, and perhaps better, solution is in the fuel itself. This may take the form of segregation of stable petroleum stocks, Esso's researchers suggest, or the use of processing or treating techniques to enhance stability, or the use of additives.

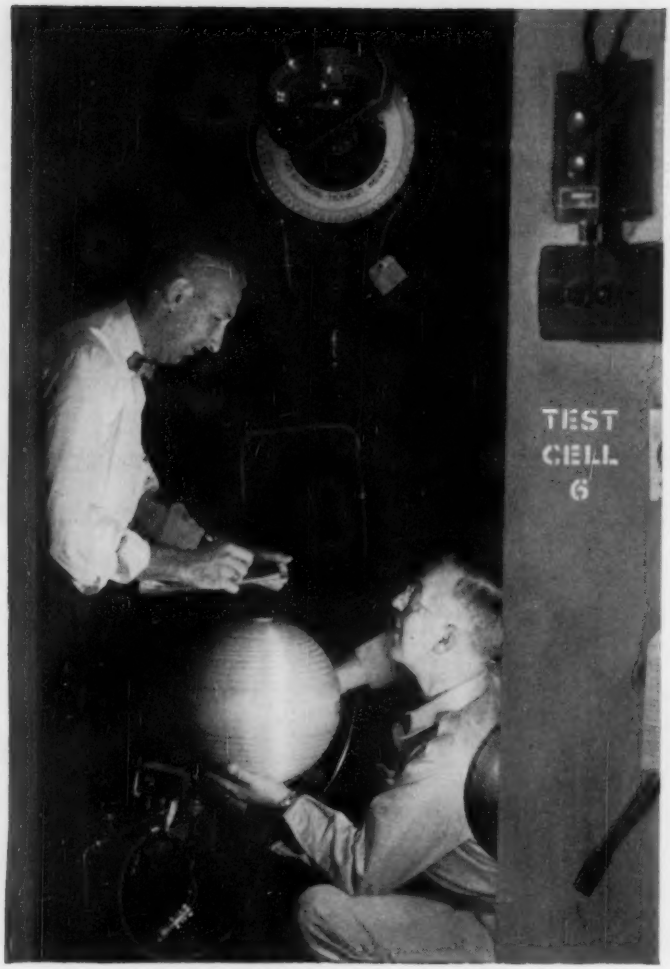
Development of new fuels hinges to a large extent on development of test procedures that will predict their performance in actual jet engines. Both Esso and Pratt & Whitney Aircraft have done considerable work along these lines. Esso reports that results in its own Erdco test rig correspond well with data P&W has collected in an operating mock-up fuel system, incorporating a fuel-oil heat exchanger, a single combustor and associated control equipment.

On the basis of experiments thus far, Esso concludes that segregation of stocks may provide better thermal stability. Fuels from different crude sources show wide variations in stability, with highly paraffinic stocks giving the best results. Acid treatment of fuel may also be effective. However, segregation means an increase in handling and storage problems and a loss of overall availability.

Use of additives would be a very convenient solution to the problem, Esso says, but must be approached with care because the effect of additives often varies with type of base stock, and may produce altitude foaming, emulsions or interference with low-temperature flow.

Aerial Survey of Spain

USAF will aerial survey Spain and provide photographs for two maps: one at 1:50,000 scale and the other at 1:250,000 on transverse and mercator projections.

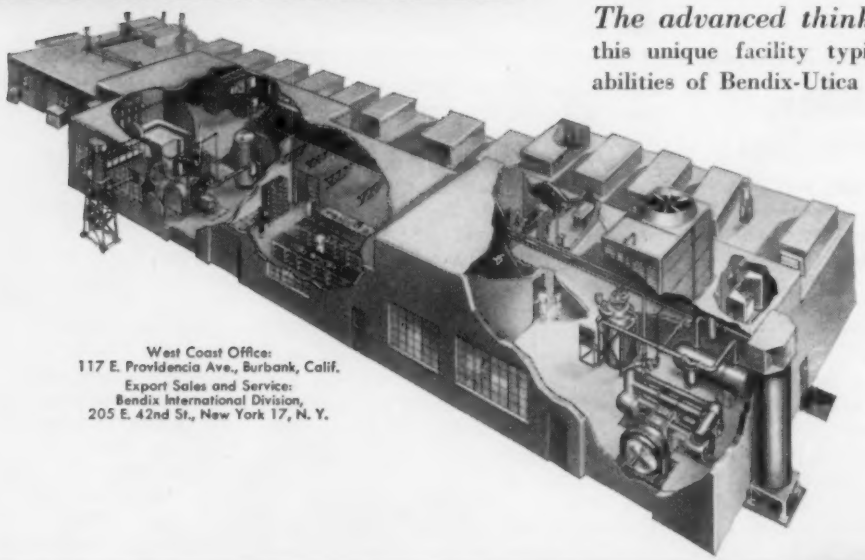


How customers benefit from advanced thinking at BENDIX-UTICA

They're specialists . . . two of many at the Utica, N.Y., Division, Bendix Aviation Corporation, who devote full time to the creation and development of *better turbine, and other components and accessories—tailor-made* to the specific needs of today's . . . and tomorrow's . . . aircraft.

At the world's finest . . . and most complete . . . proving ground for starters, pumps and other vital aircraft products . . . performance reliability is demonstrated under conditions far more exacting than would ever be encountered in actual service.

The advanced thinking which created this unique facility typifies the vision and abilities of Bendix-Utica people.



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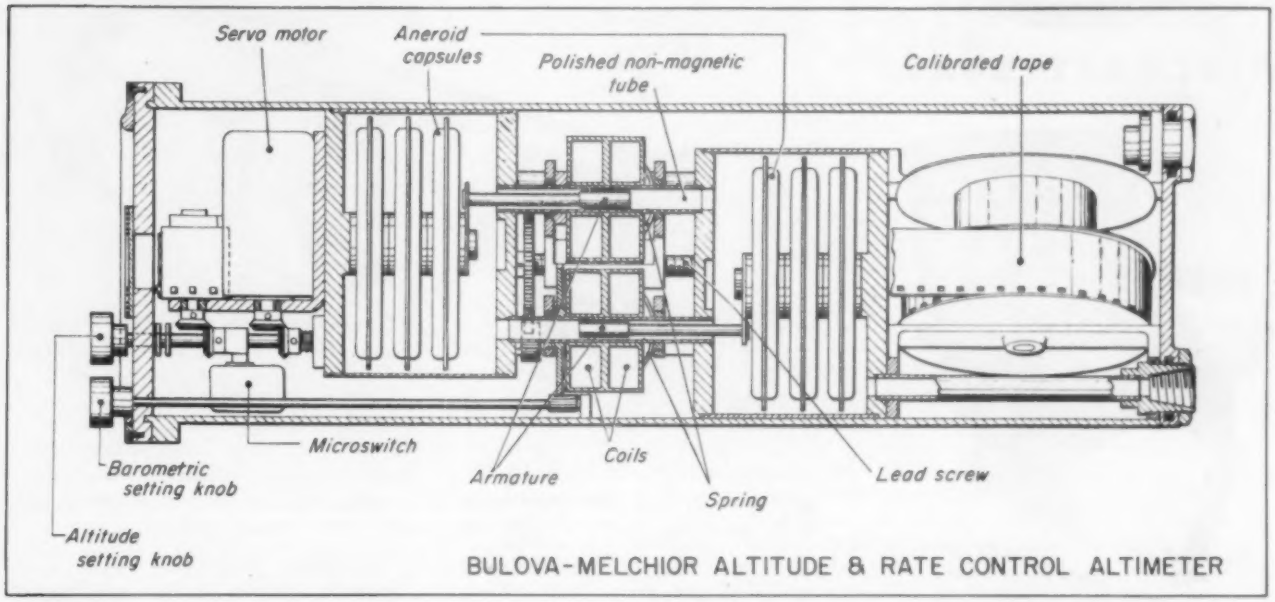

SCALE DRAWING OF HIGH-ACCURACY ALTIMETER shows aneroid capsule "unloading" details and servo-driven calibrated tape scale.

New Altimeter May Ease Problem Of High-Altitude Traffic Control

By Henry Lefer

Bulova Park, N. Y.—One of the major problems of commercial jet operation—safe vertical separation of transports at high altitudes—may be solved by a new, extremely accurate barometric altimeter to be offered to the airlines by the Bulova Watch Co.

Devices which depend upon atmospheric pressure for height indication become increasingly less precise as altitude increases and the air becomes thinner. The new altimeter is no exception, but, where conventional systems have a possible error of about 400 ft. at high altitudes, the error of this instrument will be only about one-tenth as great.

Accuracy of the new altimeter is guaranteed at one part in 3,000 throughout its entire operating range. This is the equivalent of five to 10 ft. at sea level and 40 to 50 ft. at 45,000 ft. (AW Oct. 24, p. 9). In addition, because there is said to be no measurable time lag or hysteresis in its operation, it can be used to indicate and control rapid rates of descent and climb or tied in with an autopilot to maintain level flight.

The altimeter was developed by Frederick C. Melchior of Melchior Engineering Corp., which is now working out details of a licensing agreement with Bulova for the manufacture and sale of the instrument in the United States. Negotiations also are reported to be under way with Canadian and Swedish licensees.

Bulova recently introduced the altimeter to the airlines at a special meeting held for members of the Air Transport Assn., attended by representatives of the airlines and high Bulova officials, including Gen. Omar Bradley, chairman of the board of the company's Research and Development Laboratories. Brig. Gen. Milton W. Arnold, ATA's vice president-engineering, Frank Brady, of ATA's Air Navigation and Traffic Control Division, Col. J. F. Taylor, Jr., director of the Air Navigation Development Board, addressed the meeting.

Airline Interest

As a result of the interest generated at the meeting, the company expects to receive orders soon from the airlines for a number of prototype units for evaluation and test.

A number of industry representatives also have expressed the need for a device such as this to tie in with jet transport cabin pressurization systems, making them immediately responsive to the high rates of climb and descent which will be required in commercial jet operation.

Bulova is submitting a proposal to the Wright Air Development Center to meet an Air Force specification for an altimeter accurate to within ¼ of 1%. This unit is to be a mechanical one, although the more precise one being offered to the airlines is electro-mechanical, according to William W. Shoaf, director of federal sales. Other military proposals based upon the Melchior instrument are for an airspeed indicator-Machmeter and a rate indicator.

Used as Master

Industrial versions of the Melchior unit are being produced under license by Fischer & Porter, Hatboro, Pa. Many are in use in Air Force and Navy installations and educational and commercial establishments as masters for scientific purposes and calibration of equipment. The Fischer & Porter model, marketed under the name Press-i-Cell, has been sold with a guaranteed accuracy of 1 part in 5,000, sensitivity of 1:15,000, repeatability of 1:7,000 and readability of 1:25,000.

Performance of the airborne unit may be somewhat lower than that of the master units. Its weight will be between three and five pounds.

When Melchior started development of his sensitive pressure indicator a number of years ago, his aim was to produce a landing altimeter good enough to be used for blind approaches. He set his goal at an overall low-altitude accuracy of ± 5 ft., including hysteresis and temperature and calibration errors.

The first step was to develop a means of unloading the sensing elements (aneroid diaphragm capsules), permit-

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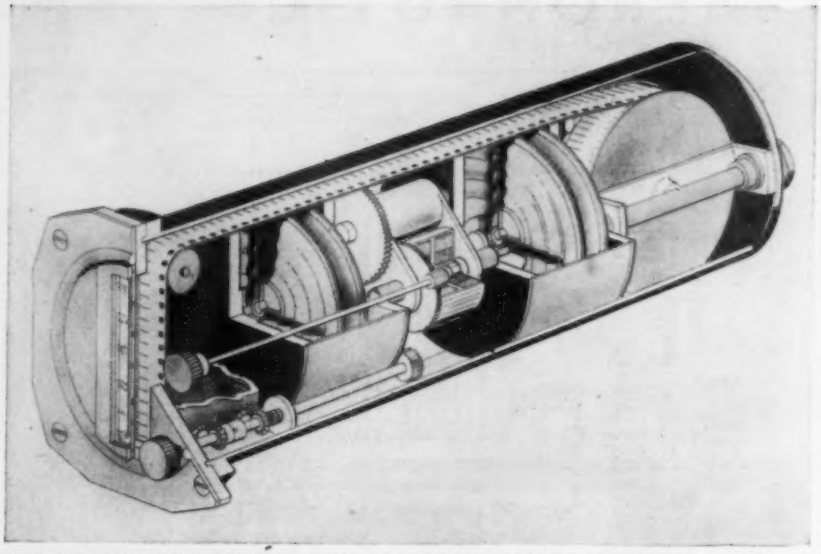


CUTAWAY OF ONE PROPOSED version shows Bulova-Melchior altimeter in circular case. Airline model will come in a square case, making a more compact package.

ting them to function without friction-producing gear trains and indicators. Tests with early models indicated that the new unloaded system was so sensitive it could use capsules of extreme accuracy, far greater than available at the time. Existing capsules suffered from excessive hysteresis, undesirable thermo-elastic properties and poor linearity and stability. When Melchior had developed suitable capsules the basis of his pressure indicator was complete.

Unloading System

Melchior has designed a number of systems for unloading his pressure capsules. In the altitude and rate control altimeter being offered to the airlines, it takes this form:

Two sets of aneroid capsules are positioned symmetrically at opposite ends of a common axis. Each set, in its own pressure chamber, consists of three capsules stacked vertically like dishes in a drying rack and rigidly attached to one another. The far end of each set is fastened to the end wall of its chamber. The chambers communicate with each other by means of thin-walled, non-magnetic tubular spacers placed between them and receive the outside ambient pressure directly from the aircraft's static tube pressure connection.

On each of the two inner (facing) capsules is a rod with a soft iron armature which moves freely inside its respective polished tube. As the capsules expand and contract with changes in pressure, these armatures move reciprocally in their tubes. On the outside of each tube is a spool containing a pair of coils, forming a double inductance bridge whose purpose is to maintain an electrical null balance.

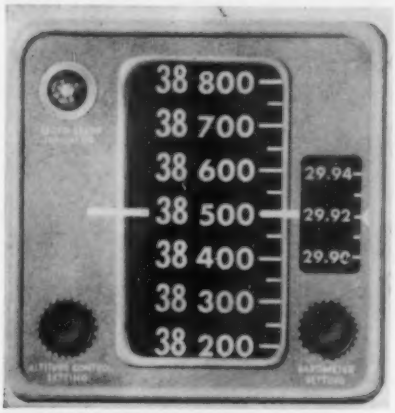
A change in pressure, with corresponding motion of the capsules and their attached armatures, upsets the balance, and a servo system goes into operation to move the coils and restore the electrical null. Synchronized with this movement is the motion of a custom-calibrated 50-ft.-long tape scale, carried on sprocket spools. A manual knob may be used to set a desired altitude in the instrument. The knob also disengages the servo motor and, via microswitch, diverts the signal produced by the inductance bridge to the control servo of the autopilot, which will then govern the plane's altitude so as to maintain null balance between the inductance coils. Melchior says this altitude control would offer a repositioning sensitivity of 10 to 12 ft. at 45,000-ft. altitude.

Another knob on the face of the instrument is used to compensate for variations in barometric pressure by turning a shaft which displaces the coils out of the null position with regard to the armatures. At the same time, a smaller tape scale operated by this shaft indicates the manually corrected setting.

Rate of Climb and Descent

Since the instrument shows no measurable lag, even at extreme rates of change, the speed of the servo motor as the coils move to reestablish null balance is a precise expression of rate of change. So, by gearing a small generator to the servo motor, the instrument may be used to provide instant indication and control rates of descent and climb.

The Melchior design is said to be immune to acceleration and gravitation forces, including vibrations in any direction. This is the result of the reciprocal design of the various assem-



ALTIMETER FACE shows altitude in center, barometric setting at right. The two lower buttons are altitude control setting (for tying altimeter to autopilot) and barometric setting knob. Upper left is indicator light to show if servo malfunctions. Case is 3¼ in. square.

blies and the fact that the masses and spring rates of both capsule groups are identical.

Melchior Capsules

Early in his capsule development program, Melchior concluded that he wanted to use Ni-Span-C nickel-base alloy, because of its very low hysteresis and practically-zero thermo-elastic coefficient when properly cold-worked and heat-treated. Since the alloy proved very difficult to work, he had to develop his own fabricating techniques. Briefly, this is how the capsules are formed:

The diaphragms are drawn in the conventional manner to something less than 50% of design depth of the corrugations. Then they are rolled with steel balls under heavy pressure in finishing dies in a Melchior-designed machine. Result, according to the inventor, is practically ideal work hardening (from cold work only), optimum ratio of depth of corrugations to residual thickness for a given stiffness, uniformity of material thickness, true radii, concentric grain structure in a radially stressed capsule and complete absence of shear stresses.

The diaphragms are assembled into capsules by electric welding under water to prevent annealing and preserve the benefit of the cold work. After the capsule is completely assembled, trimmed and tested for leaks, it is normalized as a unit by a 1-hr. stress relief treatment at 750F and 2 hr. of age hardening at 1,275F.

Master units incorporating these capsules have shown a sensitivity of better than 1 part in 100,000, registering changes of less than 3 in. at sea level. Repeatability tests have shown no measurable errors, Melchior claims, and the accuracy, including hysteresis, has in some instances proven better than 1

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

The singularly American story of Donald W. Douglas and the Douglas Aircraft Company has been told many times — the story of a young aeronautical engineer who in 1920 rented the back room of a barber shop as his first office and, starting with only $600, moulded a vision into the vast, world-renowned company that is Douglas today.

From the first airplane, the Cloudster, hand-built in an old Los Angeles lumber mill, through 29,385 military aircraft turned out in World War II to the forthcoming DC-8 jet transports, the Douglas story is woven through and through with the bright threads of energy, imagination, skill, daring and business acumen of this quiet-voiced man who not only recognized the limitless possibilities of the airplane, but proved them time and time again.

Yet Donald Douglas gives credit to others for the company's amazing achievements over the years.

In an address before the Newcomen Society, he said in part:

"I am grateful for the high honor that has been paid the company I represent. I come before you in all humility because I know that this recognition is not accorded to me alone. If deserved, it properly belongs to 76,000 of our present employees and to literally hundreds of thousands who served us during the last war and in the intervening years. To them, and not to me, tribute should be paid."

The Douglas epoch that grew from one man and a few associates to a wartime peak of six huge factories, 160,000 employees and a payroll of $1,000,000 a day is a two-fold story combining the unique saga of the DC family of transports that currently fly an average of 81,000,000 passenger miles daily and the driving development of military aircraft from the Navy's first torpedo plane in 1922 to the supersonic jet fleets of 1955.

Of the 4765 transport aircraft of all makes, all manufacturers and all nations operating in scheduled service, 2481 belong to the Douglas winged family. They fly approximately 50 percent of the passenger miles flown throughout the world each day and it has been estimated that a Douglas transport takes off or lands somewhere on the globe every six seconds.

Development of one transport alone — the DC-3 — would insure the Douglas company an everlasting chapter in aviation history, for it established the future of air transportation in 1935 and is without doubt the best known and most beloved airplane ever built.

But, as Donald Douglas once commented, the most compelling characteristic of the aviation industry is that it cannot stand still and rest on its laurels. Hence the DC-3 — with nearly 5000 of its type still flying — has been followed by successively larger and faster transports, the DC-4, the DC-6 series and more recently the DC-7, with the latest of the latter type, the DC-7C "Seven Seas," expected to establish new standards in intercontinental service shortly. And thereafter, the jet transport age with the DC-8.

And what of Douglas combat ships over the years, the scores of types that led to the rugged scrappers of 1941-45? You can follow the development lines on a Douglas chart, a variety of biplanes slimming into monoplanes, merging into such famous fighting craft as the SBD Dauntless that was the backbone of the Navy's air war, the A-20 Havoc and the A-26 (now B-26) Invader, hard-hitting medium bombers of the war era.

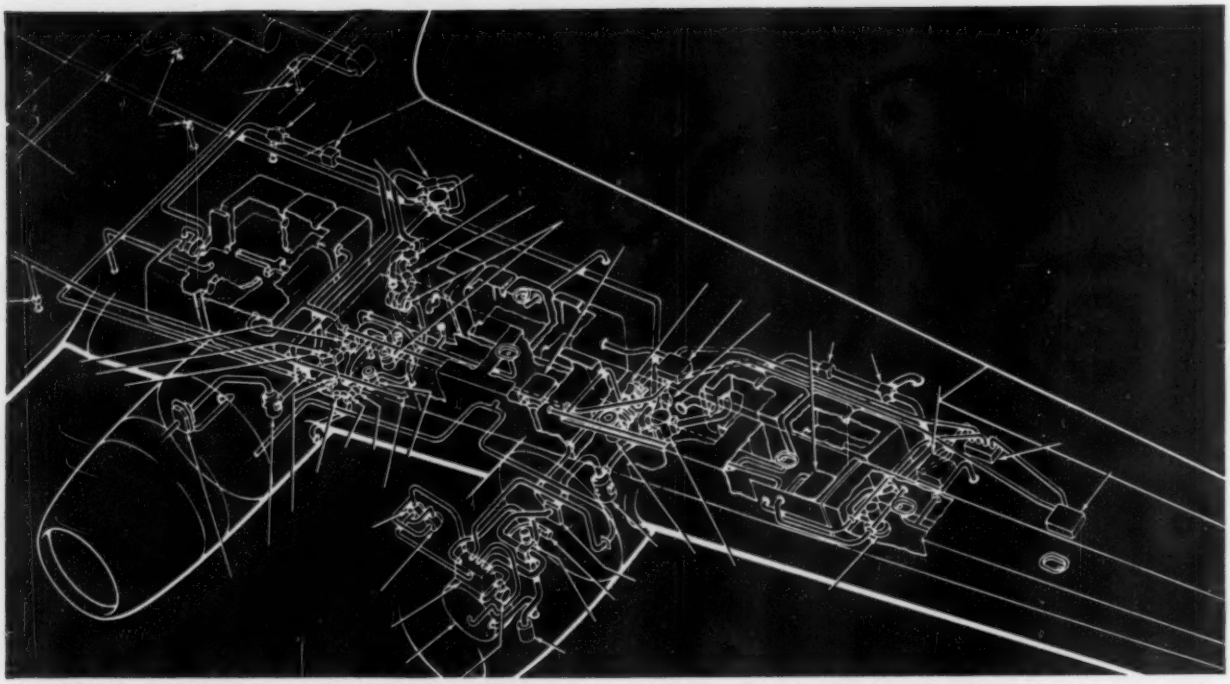
The postwar years have found Donald Douglas' company advancing not only on the transport front — including such giant cargo planes as the C-124 and its forthcoming turboprop successor, the C-133, but in combat planes, high speed research craft and guided missiles as well.

From the El Segundo plant alone have come such formidable fighting planes as the propeller driven AD Skyraider series, the twin-jet F3D Skynight, the sweptwing, twin-jet A3D Skywarrior, the sleek F4D Skyray interceptor and the A4D Skyhawk bantam bomber.

In the high speed research field, the stilleto-like X-3 is following the scorching trail of the D-558-1 Skystreak and the D-558-2 Skyrocket and its double-sonic, stratospheric records.

Missiles? The Army's Nike and Honest John and the Navy's Sparrow, among those that can be mentioned.

In all, a proud and shining record of achievement.



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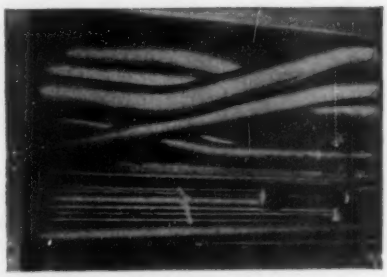

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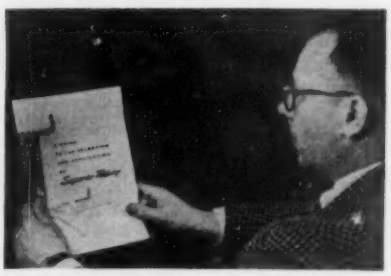

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part in 10,000 of the entire pressure range.

In altitude chamber tests, a Melchior instrument, held at a simulated 150,000 ft. for 20 min. and then brought to sea level in 5 sec., instantly indicated ambient sea level pressure with an accuracy of 1 part in 1,000. Within a minute, it was accurate to 1 part in 3,000 Melchior says. This rate of descent is far greater than anything that will be encountered in actual operation.

Calibrated Tape

The tape gives the Melchior altimeter a capability the ordinary dial-and-pointer indicator lacks. The tape can be custom-calibrated, with appropriate compensations "built in" at various points in its range by changing the distance between divisions. Or it may be calibrated to correct for characteristics of the air flow at the pitot-static tube for any particular type of aircraft.

The motion of the tape may be synchronized with conventional type altimeter dial indicators if desired.

The precision altimeter also is viewed as an important part of any system developed to permit landings under lower weather minimums. Melchior suggests that it should be used in conjunction with a master altimeter, located in the airport control tower, which would continuously transmit the absolute pressure altitude of the field to aircraft in the vicinity and automatically set this value in their altimeters.

Personnel associated with high-altitude research on jet streams have expressed an interest in the Bulova-Melchior development. With it, researchers believe they could pinpoint the upper and lower limits of the jet stream.

Bulova believes a version of the Melchior instrument, used as a speed indicator operating on dynamic pressure of the water, would be effective for automatic navigation of very-long-range submarines, such as the atomic-powered Nautilus. Shoaf says a Melchior undersea speed indicator accurate to within a small fraction of a knot can be built. This would enable a skipper to cruise submerged for long periods of time and through long stretches of water and know he would be fairly close to target when he finally brought his craft to the surface.

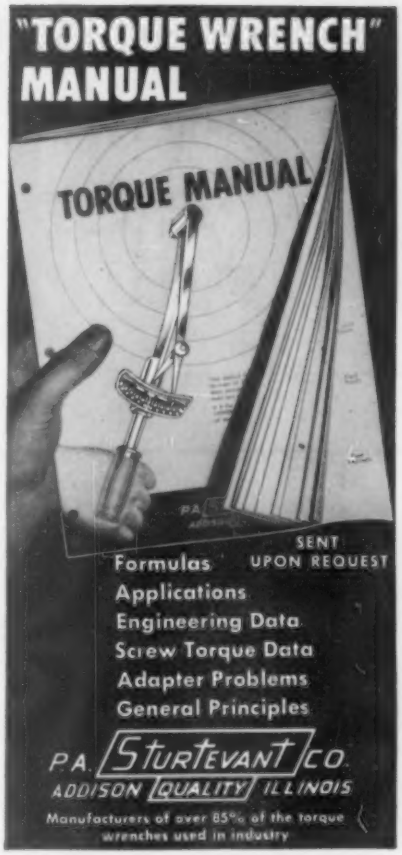
Bulova Facilities

The Bulova label, generally associated with timepieces, is found on an increasing number of products for the armed services. Last year, more than $27 million of the company's $76 million in sales was to the military. The previous year, military sales came to $17 million.

At the company's new Bulova Park headquarters, several hundred automatic screw machines turn out parts as small as a pencil dot in an impressive demon-

Army Reconnaissance Drone

Camera-carrying RP-71 reconnaissance drone sits on launching rack, poised for jet-assist takeoff at Army's Electronic Proving Ground, Ft. Huachuca, Ariz. Army says the drone can take either still or motion pictures from an altitude of several hundred feet to four miles and supply tactical commanders with aerial photos in less than an hour's time. A control operator on the ground guides the craft electronically on its mission and returns it to the launching area, where he cuts the engine. The propeller stops in a horizontal position to prevent breakage on impact with the ground, and a 38-ft. cargo parachute is deployed to lower the craft. The gasoline-powered drone appears to be a version of the Radioplane OQ-19. Statistics: top speed, 228 mph.; climb, 3,060 fpm.; length and wingspan, both 12 ft.



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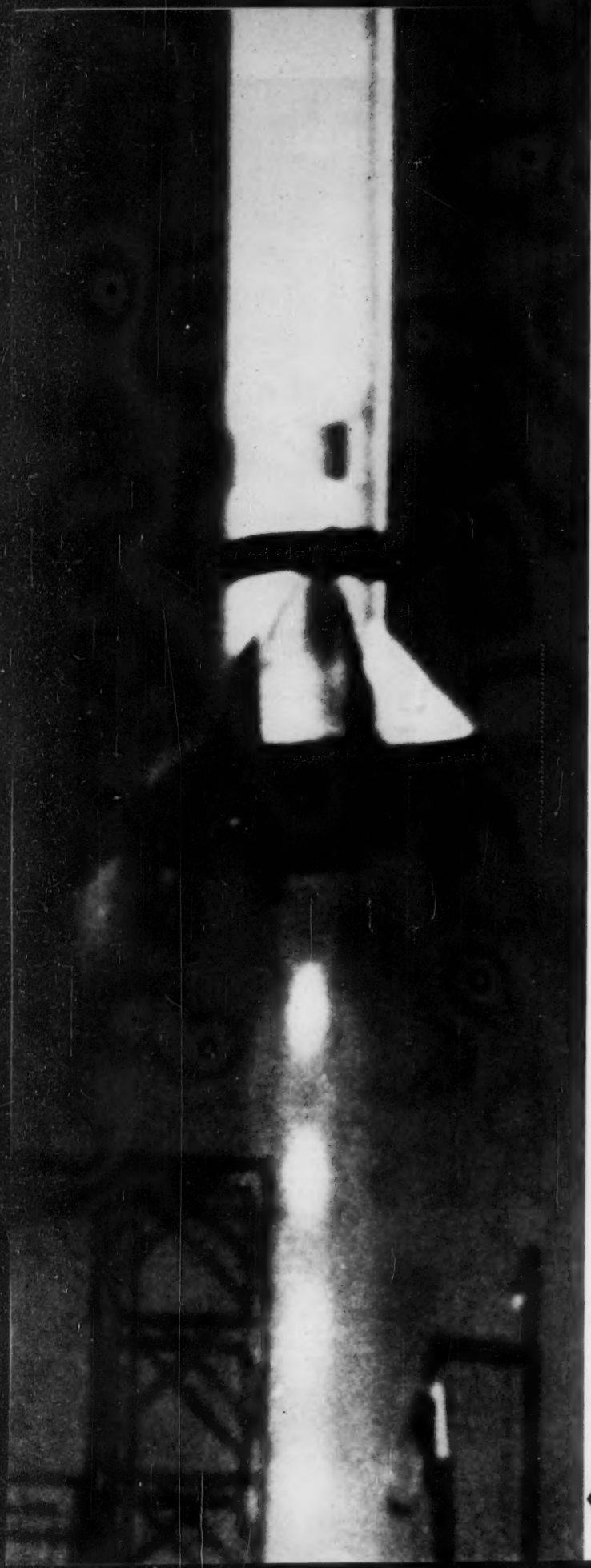


G.E. at Work for Nation's

Project Vanguard underway as G.E. teams up with Martin Baltimore to get Satellite vehicle off earth into upper atmosphere

Even as you read this, General Electric has begun work on the powerful rocket engine that will launch the world's first earth satellite.

PROJECT VANGUARD, under U.S. Navy management, will be the initial step toward the exploration of space. The satellite will be carried up in a three-stage rocket built by Martin Baltimore. It will then spin around the earth, at an altitude of some 200 miles, transmitting a description of conditions in outer space. This radio-wave description may include information on the nature of the sun, solar radiation, cosmic noise, and magnetic noises and their cause . . . enabling scientists to better understand the laws of the universe.

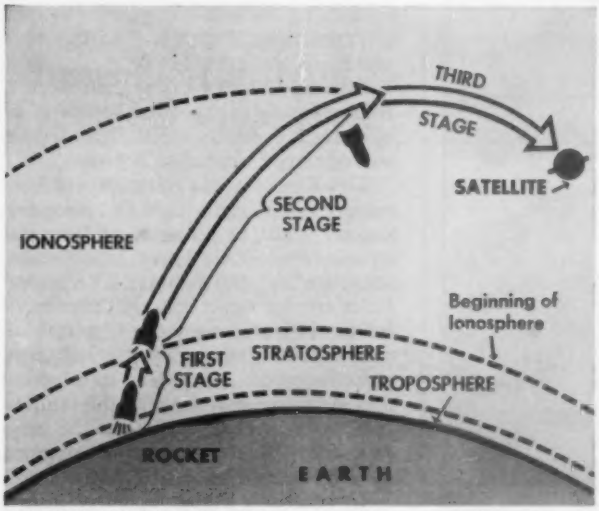
G-E DESIGN DATA ON POWERFUL ENGINE for VANGUARD's first stage cannot be revealed at this time. However, it can be said that static firing tests of similar-type G-E engines have been highly successful.

LAUNCHING OF THE SATELLITE will mark still another milestone in rocket engine progress at General Electric. Since 1945, when G-E scientists and engineers followed advancing Allied armies to study captured German V-2 rockets, the company has been constantly developing better, more powerful rocket engines. It was under G-E supervision, for example, that the existing altitude record of 250 miles for a two-stage rocket was established.

GENERAL ELECTRIC'S CONTRIBUTION to PROJECT VANGUARD climaxes the company's first decade of rocket engine development. G-E experience and know-how will continue to pay off in more powerful, more reliable rocket engines for American aviation. 234-5

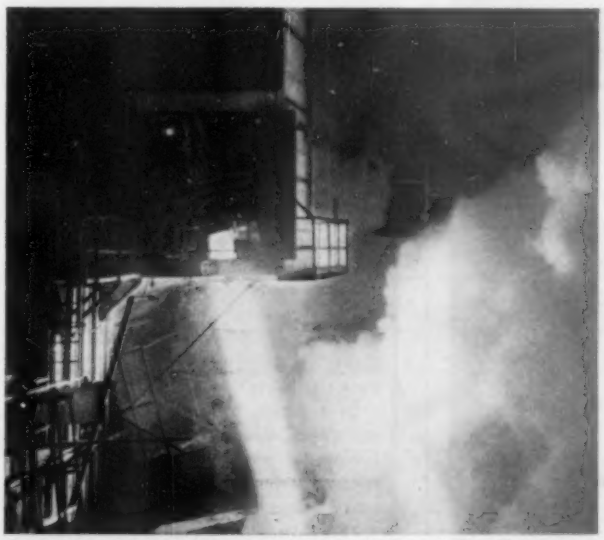
VIKING ROCKET, built by Martin Baltimore, roars from launching pad at White Sands, New Mexico. Martin's new VANGUARD airframe may be similar in appearance to this U.S. Navy high-altitude research vehicle.

on New Rocket Powerplant First Earth Satellite Project



G-E ENGINE WILL LIFT SATELLITE many miles upward, then drop off. Second engine will take over, push satellite to 2-300-mile height where third powerplant will blast satellite into 18,000-mph, egg-shaped orbit around the earth.

COMBUSTION RESEARCH is a vital phase of G.E.'s investigations in rocket engine development. Modern labs, coupled with top rocket engine design engineers, are now yielding rapid forward strides in powerplant development.



G-E STATIC TEST FIRINGS at Malta Test Station, Malta, N. Y., have already proved prototype engine's transition to full power smooth and rapid, its performance safe, reliable.

HALF-SIZE MODEL OF PREVIOUS G-E ENGINE is examined by A. P. Adamson and D. Cochran of G.E.'s Aircraft Gas Turbine Development Department. VANGUARD powerplant will be similar, but will use new fuels to assure high performance.

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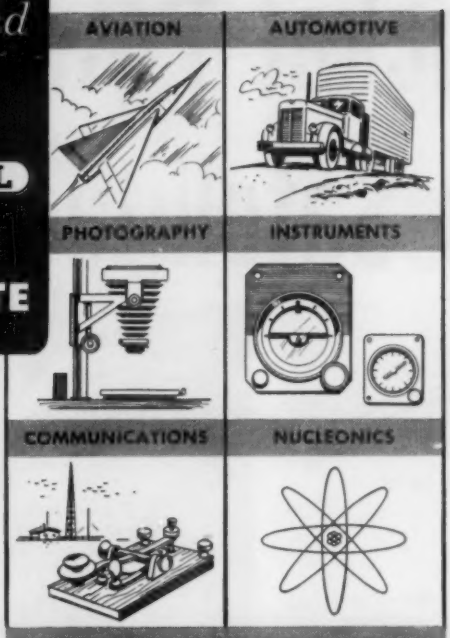

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stration of precision production and automation.

Industrial automation is described by Bulova as possibly the "key to a second Industrial Revolution." To carve a place for itself in this field, the company has set up an extensive automation research and experimentation project at its Valley Stream, N. Y., plant. A major development of this project is a new Army Signal Corps automatic factory for mechanized production of quartz crystals needed in avionic and electronic equipment. When this plant goes into full operation, 75 men will do the work previously done by 1,000.

Backing Bulova's automation work is the company's expanded activity in miniaturized electro-mechanical devices and advanced electronic systems.

The Research and Development Laboratories in Woodside, N. Y., have produced prototype cameras and special equipment for Air Force aerial reconnaissance and gun scoring. The laboratories employ more than 300 persons of whom 115 are engineers. Projects include work on microwave developments, pulse circuitry computers, mechanical and electronic instruments, miniaturization, solid state physics, stability analysis, fire control, aerothermodynamics, gyroscopes, and ordnance devices.

In addition, Bulova operates Army's Turtle Mountain Ordnance Plant, at Rolla, N. D., the only American source of jeweled bearings used in precision devices.

A single heavy bomber requires

Titanium Reaches Russia

Descriptions of, and talk about, titanium (the "wonder metal of the future") are occupying more and more space in Russian newspapers and technical journals.

In the past, the metal received only infrequent and scant attention, but censorship apparently has been lifted, and the Soviet press at the present time is urging its industry to find for it "the widest possible" uses.

In a recent article appearing in the newspaper, Komsomolskya Pravda, Prof. I. Kornilov predicted that the metal will be used extensively in most, if not all, future planes.

"Such aircraft," he said, "would weigh little more than half as much as contemporary ones while having the same structural strength. This would mean a doubling of the useful load without increasing the plane's size."

Kornilov also said that the metal—because of its resistance to salt water corrosion—would be especially valuable in "naval aviation," a phrase which, like titanium, has seldom found its way into Russian print.

more than 3,000 of these bearings, Gen. Bradley has said.

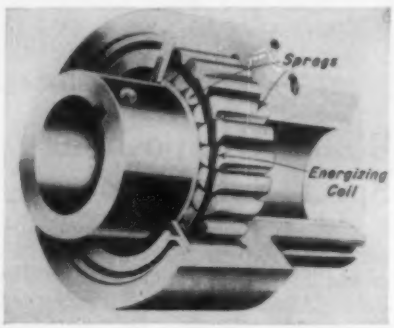
Other defense products now being turned out by Bulova include detection devices for guided missiles, mortar fuzes, mine detectors and torpedo-head assemblies. Two research projects started by Bulova last year—one in the field of terminal ballistics, the other in advanced missile systems—are now being sponsored by government defense agencies. During World War II, the company was one of the main sources for Air Force's standard altimeters.

Ultrasonic Cleaning Technique Improved

The use of sound waves for cleaning metal parts and assemblies has taken a big step forward as a result of a series of tests on ultrasonics (sound pitched beyond the limits of human hearing) at Sperry Gyroscope Co., Great Neck, N. Y.

The Sperry program, encompassing more than 10,000 tests, shows that low frequencies are much more effective than high frequencies in ultrasonic cleaning, according to Alexander Murdoch, Jr., Port Washington, N. Y., consulting engineer who developed the technique.

With high frequencies, radiated energy is concentrated in a narrow beam, and surfaces in the beam's shadow fail to get the benefit of the sound-cleaning treatment. Low-frequency ultrasonics is



Sprag Clutch for Copters

Sprag-type clutch used in Kaman's HTK-1 twin-rotor helicopter permits maximum autorotation of the blades if the power fails. Produced by the Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich., the clutch, which goes between the engine and the transmission, instantly disengages the rotors for autorotation in case of powerplant failure. The sprags are inserted in the annular space between inner and outer cluch races, maintaining contact with both race surfaces by energizing springs. When torque is applied, the sprags are instantaneously engaged; when torque is removed, the sprags release instantaneously.

YOU NAME THE NEED . . .

we'll build the inverter!

Bendix Red Bank offers you the widest range of aircraft inverters found anywhere. And because each Red Bank inverter is engineered and built as a complete, unified mechanism, it provides maximum operating efficiency on the job it is designed to do.

Over and above current production models, Bendix Red Bank experts develop and manufacture a large number of custom-built inverters for highly specialized applications. For example, in the missile field alone, a wide variety of Red Bank inverters are today giving peak performance under conditions previously thought too severe for dependable operation.

Now under construction are still other specialized inverters designed to meet even more severe environmental conditions.

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DIVISION OF Bendix Aviation Corporation

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Canadian Distributor: Aviation Electric Ltd., P. O. Box 6102, Montreal, P. Q.

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There are new opportunities for cutting assembly costs in the "Key Locking" feature of KELOX Inserts and Studs. You can improve your product and reduce assembly costs with KELOX because these fasteners—

1. Provide a positive lock between insert or stud and parent body.
2. Provide higher stress allowable per space required.
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8. Require no special threads.

KELOX Fasteners are part of a family of universally used PHILLIPS PRODUCTS that are designed, developed and distributed by a worldwide organization.

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Please send me technical data on KELOX Inserts and Studs

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Company.....

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also said to be faster and superior to the older technique of using atomized sprays of solvent.

In one test, some 20,000 precision bearings, which had been rejected for failing to pass torque tests from what was thought to be manufacturing defects, were processed. Low-frequency ultrasonic cleaning salvaged 18,500 of these; the 1,500 which could not be saved were clean but otherwise unacceptable.

Sperry also found that reconditioned bearings that had been held in stock for a considerable length of time could quickly be freed of preservative compounds and hardened or gummy greases and oils by means of low-frequency ultrasonics.

The value of very careful acceptance testing and cleaning of ball bearings is nullified, Sperry says, if the units are again contaminated by the time they have been incorporated in an assembly. However, tests showed that low-frequency ultrasonics is effective in cleaning entire assemblies and subassemblies.

Now the system is used on bomb sight, fire control and other mechanical computers involving lead screws, zero backlash gears and super precision ball bearings; component resolvers and integrators; clocks, aneroid altimeters, electrical meters, guided missile components such as hydraulic valve blocks and high-pressure flexible metallic rubber-coated hose, and 80-pitch threads, class 3 and 4 fits.

The Sperry tests and developments were handled by Frank J. Donovan, Edward T. McGann and William E. Schiela of the company's inspection department.

Bidder Symposiums Speed Subcontracts

A system of preliminary symposiums with prospective subcontractors has proved to be a big timesaver for top Boeing Airplane Co. manufacturing and engineering officials. The plan was started by Boeing-Seattle for the Air Force KC-135 program—44% of the plane by airframe weight was to be subcontracted—and proved so successful it has been extended to the B-52 programs at Seattle and Wichita. The company says the plan saves about 10 days on each subcontract.

The old method of handling subcontracts was to prepare plans and specifications for delivery to interested bidders. In working out their proposals, the prospective bidders generally had questions which required conferences with Boeing officials or visits to the airframe maker's plants for solution. To save time on the KC-135 program,

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Now, a new ally for USAF student pilots.

It's Link's latest—the ME-1 Twin Jet Trainer.

This new basic trainer makes it possible for the fledgling pilot to take a big step forward in the mastery of the techniques of twin jet flight.

As in actual air training, both instructor and pilot "fly" side by side at dual controls in the ME-1. Realism is duplicated to the point that for the first time in any ground training device, actual "G" forces are reproduced in the cockpit and corrolated with conditions of flight.

Here again, Link precision engineering is keeping pace with aviation progress . . . helping to provide better trained pilots for America's defense.

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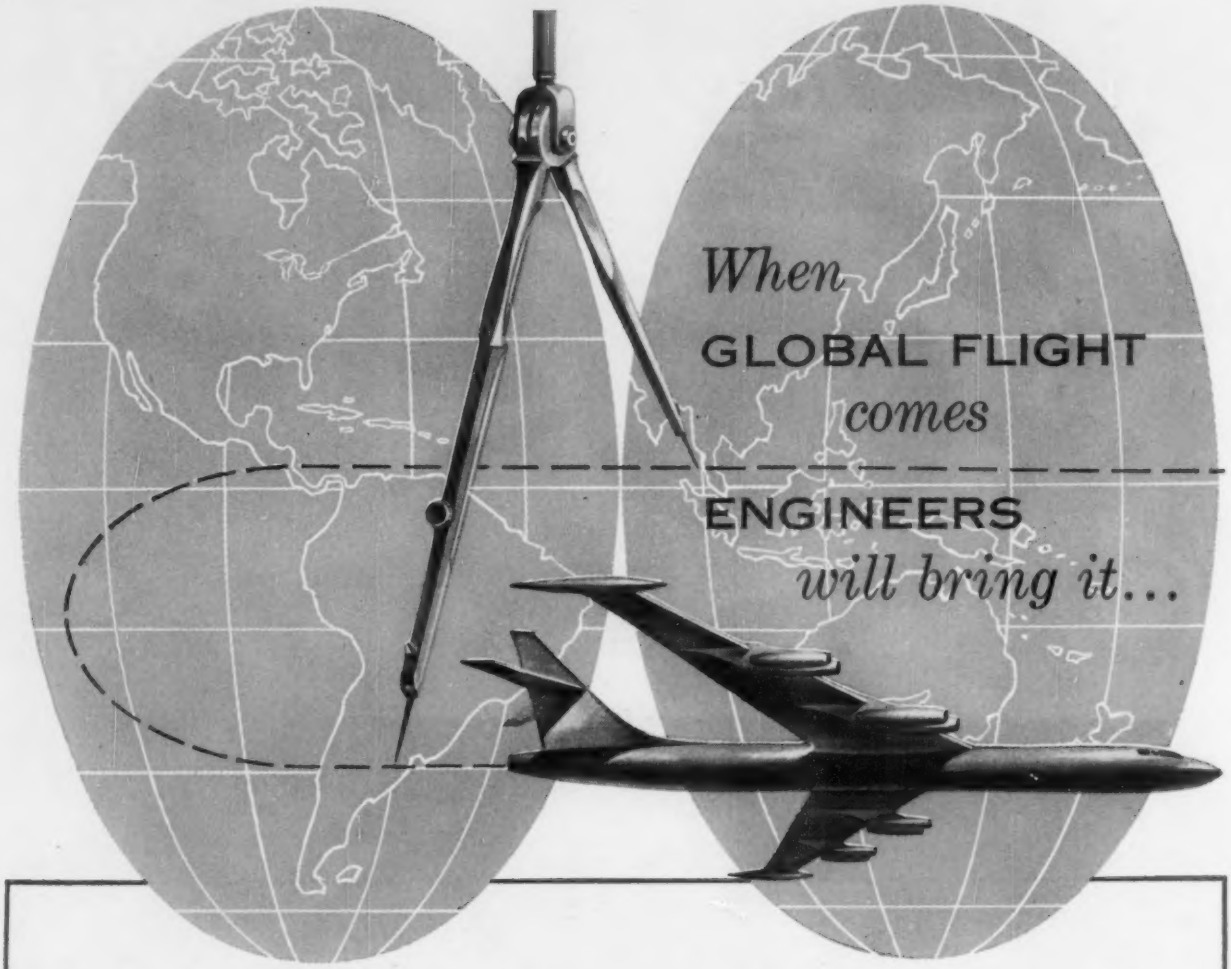
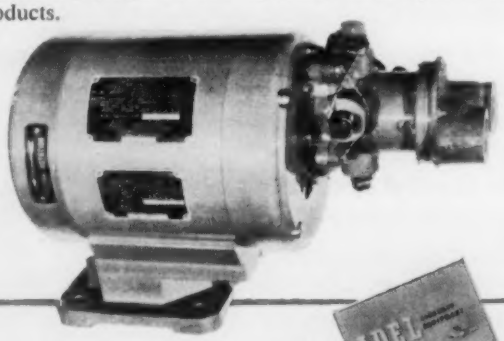


The fact that ADEL hydraulic & pneumatic control equipment; anti-icing, heater & fuel system equipment and engine accessories are in use by airplane and rotary wing aircraft all over the world today commends the *engineering* judgment that specified ADEL precision products.



Write for descriptive Bulletin containing detailed data on Anti-Icing, Heater & Fuel System Equipment.

In the *engineering* of rugged, reliable equipment for the aviation industry, *sky-high tests on the ground* is standard operational procedure in ADEL's modern laboratories. Environmental testing facilities simulate conditions of vibration, altitude, high and low temperature, relative humidity, fungus, sand and dust, explosion, etc. In-flight performance of ADEL precision products can be accurately predicted. It is *engineering* like this that assures unsurpassed equipment performance.

If it calls for CREATIVE ENGINEERING . . . ***call for ADEL!***

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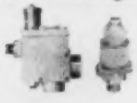
HYDRAULIC & PNEUMATIC CONTROL EQUIPMENT 

ANTI-ICING, HEATER & FUEL SYSTEM EQUIPMENT

ENGINE ACCESSORIES

LINE SUPPORTS

Boeing organized the symposiums, each one devoted to a major assembly or related group of minor assemblies. Interested bidders were invited to these symposiums, scheduled to last no more than two days each.

Here is how the method works: Boeing purchasing, design engineering, industrial engineering, manufacturing, tool and production planning, and traffic officials address the meetings, augmenting their talk with slides and motion pictures. All questions of the bidders are answered at the open meetings.

Typed copies of all talks, records of questions and answers, and reproductions of slides are given all the bidders.

After proposals are submitted, a Boeing team visits the plants of the low bidder or of several low bidders. If the team is satisfied a company can do the job, it awards the subcontract. Once the contract is awarded, Boeing quality control men work with the subcontractor in his plant to make sure that Boeing quality standards are maintained.

Boeing feels the expense of the symposiums is more than offset by the 10-day average saving in subcontract time and the reduced demand on its officials for information and help. The B-52 contracts at Seattle and Wichita involve approximately 4,500 subcontractors.

Boeing says it receives 72 cents of every Air Force dollar spent on Boeing aircraft, the remainder going for Government furnished equipment. But of its 72 cents, 47 cents goes to subcontractors and suppliers.

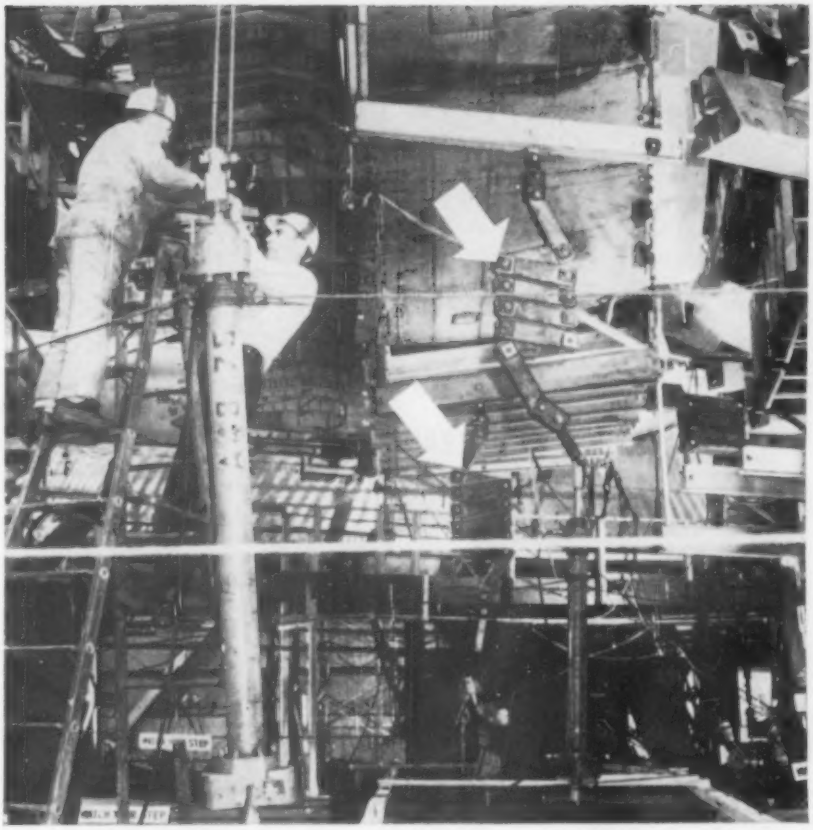
Huge Jig for New Super Connie Wing

Lockheed Aircraft Corp.'s 1649A Super Constellation program requires a wing mating and assembly fixture so large that workmen have to communicate by intercom telephone. The plane's thin tapered wings are 150 ft. long and have an area of 1,850 sq. ft. The jig makes it possible to build wings incorporating only one manufacturing joint, Lockheed says.

The huge, bridge-like structure, specifically built for quantity production of the extra-long-range Super Constellation, will cost more than $100,000. Thirteen other tools to be used with it will add another $750,000 to the cost.

The jig features special optical equipment capable of detecting minute variations in the basic structure or in wings under production, and devices for compensation of temperature expansion and contraction. Despite its size, the unit can be moved as assembly lines expand.

The wing will be in a vertical position while being built on the new mating and assembly structures. In the jig it will be joined temporarily into a one-piece structure, then separated for mating to an interconnect structure on the fuselage. Wing-fuselage mating will take place in the normal horizontal attitude.



New Brakes Control Test Damage

The zigzag "extension brakes" shown above (arrows) were developed at Boeing Aircraft Co. as highspeed energy-absorbing devices for use in the B-52 structural test program. The brake links are constructed on the same principle as aircraft disk-type brakes—alternating layers of sheet steel and bronze bolted together. They are then assembled into the zigzag extension brake.

When a section of the aircraft fails during a test to destruction, the brakes control its motion, reducing secondary damage to the remainder of the structure. The brakes are normally compressed, but load extends them. Device can be adjusted for practically any load or extension, Boeing says, by varying the number of bronze and steel sheets, or the number of links, or by adjusting torque on the bolts holding sheets and links together.

Boeing believes the brakes could be applied to emergency arresting gear on runways or other tasks requiring high-speed energy absorption.

New Small Engine For Copters, Drones

A five-cylinder sleeve valve aircraft engine designed for use in single-place helicopters, flying platforms and low-speed target drones is one of three new aviation products announced recently by Vard Inc., Pasadena, Calif.

The four-cycle powerplant produces 64 hp. at 6,000 rpm. Exhaust and intake ports are identical, and, by rotation of the sleeve cranks, left and right hand rotation can be accomplished.

The other Vard developments:

• **Magneto-distributor** that provides a more reliable ignition system for high-altitude, piston-powered planes. Components include an inductor-type alternator, triggering section, condenser and high-tension coil. Triggering section replaces the breaker points in a conventional magneto through an electronic triggering circuit energized by alternator peak voltage.

The company claims its design eliminates breaker point difficulties such as point wear or gap variation,

dependable subminiature indicator lights

WITH W-I-D-E ANGLE VISIBILITY

Light "piped" throughout entire periphery of long plastic lens assures easy visibility of signal from all sides.

- Smaller, truly subminiature size
- Fully illuminated lens is clearly visible from any angle
- For either standard or edge-lit panels
- Designed to meet critical aviation performance standards

Larger illuminated area... smaller physical size

Smaller than most subminiature lamps, yet with uniformly bright wide-angle visibility, Hetherington L6000 Series make ideal indicator or warning lights for critical military as well as many commercial applications. Using AN-3140 lamps fitted into a heavy plastic lens $^{27}/_{64}$" long, these rugged lights are $1^{1}/_{32}$" overall, and mount in a $^{13}/_{32}$" hole. Details in Bulletin L2.

"Standard" Hetherington Lights Fill Most "Special" Requirements

EDGE-LIT PANEL MOUNTING Series L2000

. . . for MIL-P-7788 panels. Sturdily constructed of nickel-plated brass with integral molded-in terminal and snug-fitting plastic lens that will not vibrate loose. Easy to mount. Write for Hetherington Bulletin L1.

REGULAR PANEL MOUNTING Series L1000

Combines exceptionally small size and light weight with durable vibration-resistant construction. Sealed against moisture. Terminal is molded into the assembly. Ask for Bulletin L1.

"PUSH-TO-TEST" INDICATORS Series L3000

Ideal for many military as well as industrial uses. Bulb is lit by pressing spring-mounted lens button. Supplied with or without silicone boot for moisture protection. Send for Hetherington Bulletin L1.

SWITCHES WITH BUILT-IN LIGHTS . . .

Developed originally by Hetherington as hostess call lights, these compact little units are now available for a broad range of exacting commercial or military aircraft services. Write for Hetherington Catalog.

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point bounce due to high speed, point arcing at altitude, and radio interference resulting from point sparking. • **Magnetic clutch** for application in the servo-mechanism field, including autopilots. Clutch functions as a torque-transmitting device and can be controlled externally with applied d.c. excitation which requires approximately 5% of power being transmitted at any nominal speed.

By using adjacent clutches and various excitations, control of actuator gear box outputs can be accomplished.

Navy Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Navy Contracting Offices:

BUREAU OF AERONAUTICS, Washington, D. C.

AiResearch Mfg. Co. of Arizona, Sky Harbor Airport, 402 S. 36th St., Phoenix, Ariz., conduct tests on the GTP70-6 and -10 auxilliary power units, reports, NOas 55-773-c (PP-32-784-55), $34,066.

Bendix Products Div., Bendix Aviation Corp. South Bend 20, Ind., conduct a study program on spray cooled brakes encompassing seven tasks, reports, NOas 55-868-f (AE-63-1834-56), $25,813.

Hoffman Laboratories Inc., 3761 South Hill St., Los Angeles, Calif., 72 man-months of field engineering services in connection with the assembling, altering, repairing, or operating, or assisting or giving instructions in these respects for aircraft electrical and electronic equipment, NOas 56-116-s (MA-30-4410-56), $84,130.

NAVY BUREAU of ORDNANCE, Washington, D. C.

Hycon Manufacturing Co., Pasadena, Calif., field engineering services in connection with guided missiles test equipment, NOrd-16353, $50,000.

General Electric Co., Washington, D. C., materials and services for repair, overhaul and maintenance of guns, gun mounts, and missile launchers, NOrd-16481, $55,000.

Norden Laboratories Div., Norden-Ketay Corp., White Plains, N. Y., developmental work in connection with computer CP-66/ASB-1 and CP-66A/ASB-1, $96,271.

Bulova Watch Co. Inc., Flushing, N. Y., fabrication of ordnance equipment NOrd-16489, $133,199; development of a booster separation timer, NOrd-16488, $151,341.

AVIATION SUPPLY OFFICE, Philadelphia 11, Pa.

American Pad & Textile Co., So. Washington St., Greenfield, Ohio, yoke type preservers, (IFB-383-12-56), various, $55,-107.

National Lead Co., 2607 E. Cumberland St., Philadelphia 25, Pa., paint, (IFB-383-41-56), 17,300 gal., $34,677.

Hydro-Aire Inc., 3000 Elnona Ave., Burbank, Calif., maintenance parts used on assemblies for various aircraft, (383/29043-40X4/1/56), $29,327.

International Business Machines Corp., 7800 Ogontz Ave., Philadelphia 38, Pa., magnetic tape, (288/8153/56), various, $45,300.

Turco Products Inc., Terminal Annex 2649, Los Angeles 54, Calif., compound (383/29081-1436-G 4/5/56), 114,500 gal., $153,172.

Breeze Corps. Inc., 700 Liberty Ave., Union, N. J., ignition harness assys., (383/-2116-30/54), 165 ea., $42,075.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., maintenance parts for various carburetors, (383/29023-14X3/4/56), $25,831.

Servomechanisms Inc., 316 Washington St., El Segundo, Calif., technical publications (PDEN11-5480-56 (434-55), $37,855.

Scintilla Div., Bendix Aviation Corp.,

Sherman Ave., Sidney, N. Y., ignition harness assys., (383/2116-151/51, 383/2116-131/52, 3832116-7853), 408 ea., $129,948.

New York Air Brake Co., Starbuck Ave., Watertown, N. Y., hyd. pumps for FJ-3 aircraft, (383/2150-152/53), 187 ea., $91,654.

Glenn L. Martin Co., Baltimore 3, Md., panel assys. for JRM A/C (383/29011-11A/-3/17/56), 11 ea., $30,870; panel assys., (383/29011-11A/3/17/56), various, $45,531.

Westinghouse Electric Corp., 3091 Walnut St., Philadelphia 4, Pa., clutch pack assys. used on actuators, (383/2110-1588/51), 1,661 ea., $38,286.

Holley Carburetor Co., 5930 Vancouver Ave., Detroit 4, Mich., services required to overhaul & modify main fuel controls (MIPR 41-608-6-02P-2000), various, $72,314.

Chandler Evans Div., Niles Bement Pond Co., West Hartford, Conn., carburetor & maintenance parts for P2V-7 A/C (288/9800-48/55), various, $68,056.

Lord Mfg. Co., 1653 W. 12th St., Erie 6, Pa., isolators for various A/C, (383/2110-1667/51, 383/2110-1444/52, 383/2110-177/54) 30,373 ea., $202,296.

Industrial Hard Chrome Plating Corp., 1401 Park Ave., Emeryville 8, Calif., services required to chromium plate A/C engine cylinder (383/23055-36P2/1/56), 1,444 ea., $48,013.

Aeronautical Machinery Corp., c/o Nestor Johnson Mfg., Co., 1900 N. Springfield Ave., Chicago 47, Ill., tail universal jacks (383/29065-22S 3 21/22/56), 82 ea., $64,632.

General Electric, 1405 Locust St., Philadelphia 2, Pa., voltage regulators, (IFB-383-1085-55), various, $103,942.

Sigmund Eisner Co., 2-38 Bridge Ave., Red Bank, N. J., coveralls & glove assys., (IFB-383-57-56), various, $87,064.

General Communication Co., 681 Beacon St., Boston 15, Mass., relay, (IFB-383-1-56), 662 ea., $47,995.

Atlas Paint & Varnish Co., 32-50 Buffington Ave., Irvington 11, N. J., enamel, (IFB-383-1070-55), 28,270 gal., $65,225.

Elcor, Inc., 1501 West Congress St., Chicago 7, Ill., inverter, (IFB-383-939-55), various, $41,156.

Shell Chemical Corp., 380 Madison Ave., New York 17, N. Y., alcohol, (IFB-383-1092-55), various, $140,075.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

Permoflux Corp., 4900 W. Grand Ave., Chicago 39, Ill., headset assys, (383/29031-74-E2/5/56), 5885 ea., $84,517.

Small Motors, Inc., 2076 Elston Ave., Chicago 14, Ill., generators, (PREN11-2972/55), 747 ea., $37,157.

The Liquidometer Corp., 41-03 36th St., Long Island City, N. Y., tank units, (383/2120-467/52, 383/2120-219/50), various, $43,-075.

Robertshaw-Fulton Controls Co., Aeronautical Div., Santa Ana Freeway at Euclid Ave., Anaheim, Calif., valves (383/2150-1018/52, 383/2150-410/53, 383/2150-126/54), 105 ea., $46,863.

The B. F. Goodrich Co., 500 S. Main St., Akron 18, Ohio, wheel assys. (383/2110-632/53, 383/2110-47/54), various, $72,533.

North American Aviation Inc., Columbus Div., 4300 E. Fifth Ave., Columbus 16, Ohio, maintenance parts for AJ Aircraft, (383/2110-1745/51), various, $36,051.

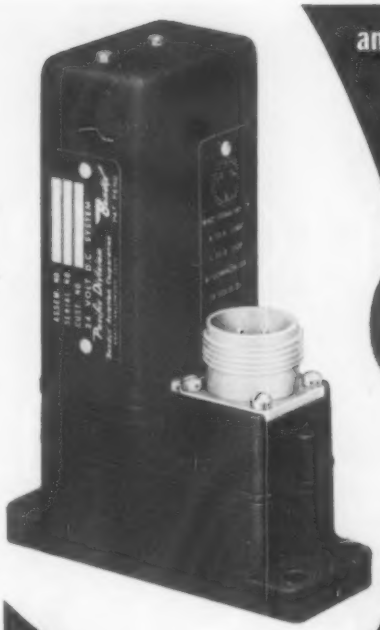
Lord Mfg. Co., 1635 W. 12th St., Erie 6, Pa., isolators, (383/29011-14x7/2/56), 503 ea., $35,004.

Federal Aircraft Works, 3456 N. Mississippi Drive, Minneapolis 12, Minn., skis, (383/2110-1467/50), 10 sets, $38,402.

Western Gear Works, P. O. Box 192, Lynwood, Calif., actuators, (383/2110-1627/51, 383/2110-1355/52), 59 ea., $37,438.

Fram Corp., 55 Pawtucket Ave., East Providence 16, R. I., filter element, (IFB-383-1075-55), various, $48,495.

Electrolux Corp., 51 Forest Ave., Old Greenwich, Conn., armature-dynamotor shaft Electrolux P/N 24615-1, (RFP 33-604-55-3834), 2000 ea., $49,720.



another filter problem solved . . .

R-F NOISE ELIMINATED IN BENDIX VALVE ACTUATOR

PROBLEM: Bendix Aviation Corporation's Pacific Division, North Hollywood, California, manufactures a series of rotary electric actuators for operating valves in aircraft. But getting a small, lightweight filter to keep the motor from creating radio-frequency interference proved to be a real problem. Any such filter would have to be mounted as an integral part of the square motor actuator, and the required 150°C operating temperature didn't help any.

APPROACH: Bendix Pacific engineers took their problem to the Radio Noise Suppression Laboratories of the Sprague Electric Company in Los Angeles. There, Sprague and Bendix engineers cooperated in making radio interference measurements and setting up envelope and mounting provisions for the proposed filter.

SOLUTION: A filter was designed by Sprague to meet the envelope, mounting and 150°C performance needs. The filter successfully passed radio interference requirements of MIL-I-6181, MIL-I-6181B, and also, the rigid requirements of MIL-E-5272A. When mounted, the Sprague filter is completely encased in the motor, with the filter terminals utilized as the motor terminal strip.

PRODUCTION SCHEDULES for these and many other filters are regularly met by Sprague plants on both coasts. We would like the opportunity to solve your problem too. Write, wire, or phone Sprague Electric Company, 12870 Panama Street, P.O. Box 66507, Los Angeles 66, California (TExas 0-7531) or North Adams, Massachusetts (MOhawk 3-5311).

Sprague on request will provide you with complete application engineering service for optimum results in the use of radio noise filters.

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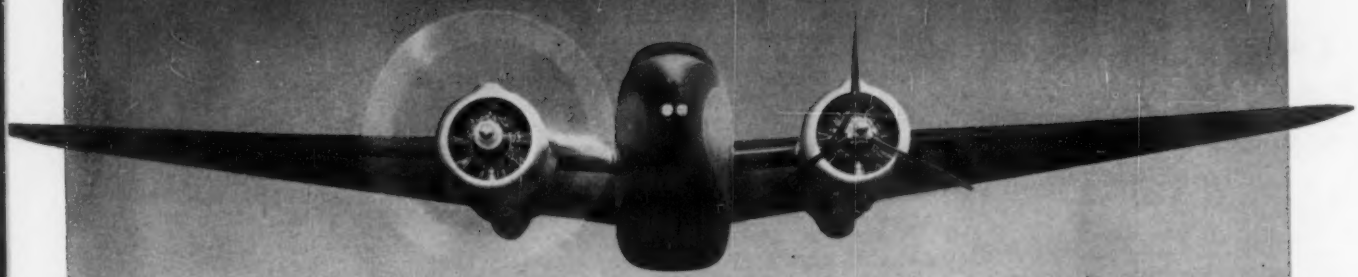
World's Largest Capacitor Manufacturer

more performance in reserve

...than any other executive airliner



Learstar

LEAR, INCORPORATED, AIRCRAFT ENGINEERING DIVISION, SANTA MONICA, CALIFORNIA • THE LEARSTAR IS A MODIFICATION OF THE FAMOUS LOCKHEED LODESTAR

ANDB Chief Warns:

Communications to Pace Aviation Growth

By Philip J. Klass

Utica, N. Y.—Communications' facilities must be greatly expanded and improved upon within the next ten years if military and civil aviation are to achieve their predicted growth potential. This warning was sounded here by Col. J. F. Taylor, Jr., director of the Air Navigation Development Board, in a speech before the recent Symposium on Aeronautical Communications.

Despite ANDB's apparent pre-occupation with navigation-aid problems, such as Tacan/DME, Taylor called communications "one of the biggest challenges to the ANDB today."

32 Million Postings

Pointing out that official predictions of aviation growth inevitably fall short of actual growth, Taylor cited a Civil Aeronautics Administration forecast which indicates that civil air traffic will double in the next 10 years.

Translated into fix postings, which are used to keep tab on aircraft operating under instrument rules (IFR), and into instrument approaches—both of them a measure of the demands which will be placed on our communications capabilities—Taylor said that the CAA study indicates that 1965 will see:

- **32 million fix postings,** compared to 16.9 million today and 8.8 million in 1946.
- **1.1 million instrument approaches.**
- **1.1 million instrument departures.**

(Taylor said that this is a personal "guesstimate" based on his feeling that instrument departures will equal approaches in 1965.)

IFR for All?

These figures are based on IFR and VFR operations as now conducted.

However, there is growing support in some quarters to conduct all flights under IFR procedures even in good (VFR) weather, particularly in congested areas. In such areas, ground controllers and air terminals need to know in advance when and how many aircraft can be expected to arrive.

The use of IFR procedures also is suggested to alleviate the growing threat of mid-air collision, and the need will grow when jetliners go into operation.

Although Taylor declined to comment on the wisdom of this new philosophy, he emphasized that if adopted, it would further increase the load on present communications capabilities.

Clear Channels Needed

ANDB hopes soon to evaluate two ASDEs—airport surface detection equipments—high resolution radar employed to direct airport traffic and to be sure that runways and taxi-ways are clear.

One of the ASDEs is the British Decca system, described by AVIATION WEEK June 20, p. 51; the other is being developed by Airborne Instruments Lab.

Taylor indicated that ASDEs probably will be installed at approximately 20 of our larger civil airports plus a number of military fields.

The use of ASDEs will "impose an entirely new communications load," Taylor pointed out. If an ASDE operator sees that a vehicle has suddenly darted out into a runway or taxi-way, he must have instant access to a "clear channel" which will enable him to warn an approaching aircraft.

Add Helicopter Requirements

The fast-growing use of helicopters for short-haul passenger traffic, not only increases the communications problem by adding air traffic, but further aggravates the problem because of their ability to operate at low altitudes off the main airways where present VHF line-of-sight coverage may be inadequate. This may require new high-site locations for communications transmitters and receivers.

One evidence of growing helicopter traffic cited by Taylor: New York Airways now is second only to American Airlines in the number of daily movements out of LaGuardia.

Modulation of VHF communications by rotors probably can be overcome, Taylor said, but it does present a problem. He cautioned that "rotary wing aircraft will have to be thought of as a completely new element in the communications system and not dismissed as requiring the same type communications as fixed-wing types."

New Navigation Aid Coverage

The new coverage plan for navigation services required in the 1965 period and thereafter, worked out by ANDB's Advisory Committee No. 3 in connection with the Tacan/DME controversy (AW Nov. 21, p. 61), "has a fair chance of becoming U. S. navigation policy, although at the moment it does not have Air Coordinating Committee approval," Taylor reported.

This plan calls for complete airways navigation aid coverage from 700 to 18,000 ft., and area (grid) coverage from 18,000 to 75,000 ft., Taylor said. In order to control traffic over such a system, ground controllers must be able to talk with aircraft.

For the 700 to 18,000 ft. altitude airways coverage, using line-of-sight communications, "we have another new requirement," Taylor said.

Code Could Help

Several existing programs and techniques offer some hope for easing the pressing communications problem, Taylor said. For instance, studies by Bell Telephone Laboratories in three of the busiest sectors of Boston air route traffic control center indicate that most communications between pilots and ground controllers can be sent by code instead of voice.

This would involve the use of an Air Traffic Control Signaling System (ATCSS), operating through existing VHF receivers equipped with a suitable decoder and cockpit display. (The basic elements of such a system have been developed by Melpar, as reported in AVIATION WEEK Oct. 17, p. 79).

When the ground controller wants to transmit a "routine" message to an individual aircraft, he pushes a suitable button which addresses the message to the individual plane, plus another button which transmits the desired message. In the cockpit, this coded message is de-coded and displayed visually, perhaps on a storage-type of cathode ray tube.

Such a system would be capable of handling 150 aircraft in one area simultaneously, transmitting fresh or repeat messages to each aircraft once every minute, Taylor said.

The use of ATCSS for routine messages between pilot and controller would avoid misunderstood messages, repeats, and permit the use of voice communications for situations not covered by the ATCSS codes or for emergencies.

Although such an ATCSS system requires some further development, it is "not necessarily a long-term development," Taylor reported, indicating that

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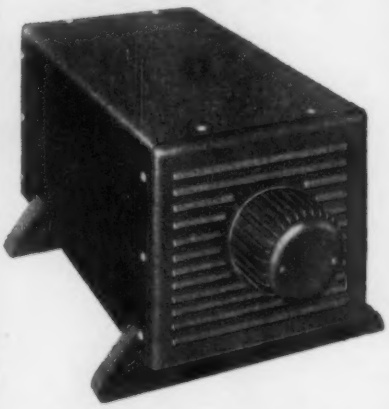

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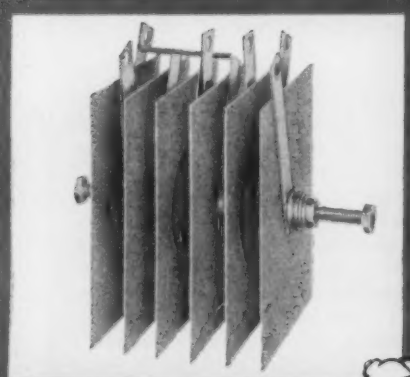

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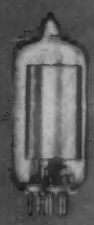

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ANDB intended to pursue the Bell recommendation.

Assist From Transponders

The air traffic control beacon system, whose airborne transponders are designed to reinforce blips on ground radars and provide individual aircraft identification, may be expanded to ease communications congestion. If sufficient codes can be made available, the airborne transponder could be used to automatically report the plane's barometric altitude to the ground controller, eliminating the usual voice reports. This feature would be particularly useful in crowded terminal areas.

This program perhaps offers the greatest immediate hope, because it apparently is closer to the operational stage than any other possibilities, Taylor said.

Unlimited Capacity Is Goal

In urging symposium members to put on their thinking caps, Taylor pointed out that it is not sufficient to aim for the needs of 1965, formidable as they now seem. "We must allow for communications to serve more than the minimum requirement 10 years from now," Taylor said.

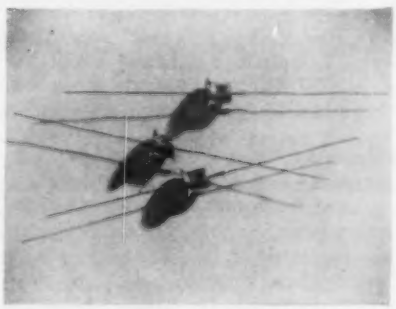
"Ideally," he added, " the Common System should have limitless communications capacity. In fact, this might be stated as the real goal."

Taylor concluded that "It appears to me that developers of television, computers, radars and landing systems are going to lose the glamor they have acquired in the last few years to the communications engineer. His job looks the toughest to me."

NEW AVIONIC PRODUCTS

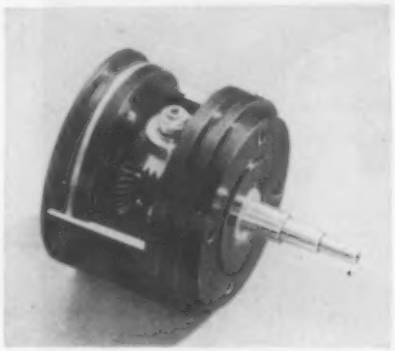
Components & Devices

● **Miniature power diodes,** germanium junction types 1N91, 92 and 93, are capable of handling up to 25 watts, and operating at frequencies up to 50 kc., reportedly at high efficiency. Peak inverse voltage rating of up to 300 v. is



available, and full-load voltage drop is approximately 0.5 v. Bulletin PD gives application details. **Clevite Transistor Products, 241-257 Crescent St., Waltham 54, Mass.**

● **Precision differential,** Model T750, employs concentric input and output shafts which simplify mounting and



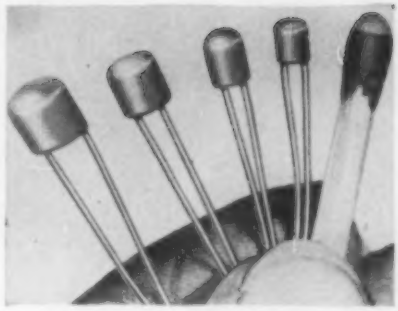
permit housing in a dustproof container. **Sterling Precision Instrument Corp., Instrument Div., 34-17 Lawrence St., Flushing 54, N. Y.**

● **Frequency-sensitive relay,** Series TR, is available in standard models tuned to frequencies in the range of 40-170 cps., with other frequencies available on special order. **Potter & Brumfield, Princeton, Ind.**

● **Constant-voltage source,** known as "K-volt Standard," provides constant d.c. output through ambient tempera-

ture range of −55C to 100C. Unit, available for operation from 26.5 v. d.c. or 117 v. a.c., provides d.c. output of 6 volts or 1 volt, at 1 or 10 ma. Random drift is quoted at less than 0.1% for 1,000 hours operation. Device measures 1¼ in. in dia. x 1½ in., weighs less than 3 oz. and comes with a 7-pin base. **Avien, Inc., 58-15 Northern Blvd., Woodside 77, N. Y.**

● **Sub-miniature selenium diodes,** Type 6U1, 7U1, and 8U1, for airborne use



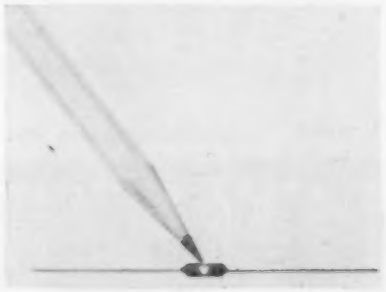
at temperatures of −50C to 100C, are rated for input voltages of 156, 182, and 203 v. rms., respectively, at 1.5 ma. Application data is available from **International Rectifier Corp., Product Information Dept., El Segundo, Calif.**

● **Motor-blower** for cooling avionic equipment can be operated continuously at temperatures up to 260F. Fan turns at 10,000 rpm, and complete unit meas-

ures 2⅞ in. in dia. x 3¾ in., weighs approximately 1 lb. **AiResearch Manufacturing Div. of Garrett Corp., Los Angeles, Calif.**

● **Miniature VU and DB panel instruments,** 1½-in. size, designed to MIL-M-10304 and -3823 specs, are available in either square or round housings, with watertight sealed housing. Technical data sheet VU133 gives application data. **DeJur-Amsco Corp., Electronic Sales Div., 45-01 Northern Blvd., Long Island City 1, N. Y.**

● **Sub-miniature wire-wound resistor,** precision type, measures only ⅛ in. in dia. by ¼ to ¾ in. long, depending upon



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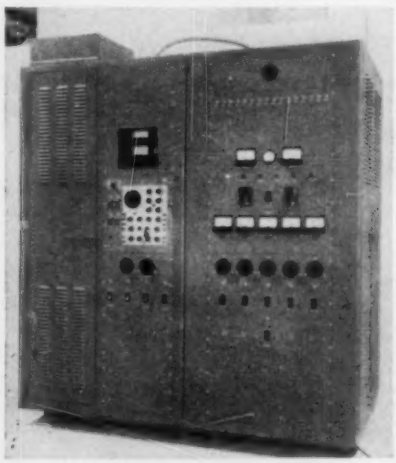
resistance value. Midget units are available with resistances of 0.1 ohm to 0.5 megohm, in standard tolerances of 0.1%, ¼%, ½% and 1%. All units have temperature coefficient of 20 ppm./deg. C. **Precision Resistor Co., Inc., 107 U. S. Highway 22, Hillside 5, N. J.**

• **Miniature rotary switch,** Series 7000, measuring only 1.16 in. in diameter, including contacts, is available in standard contact arrangements with from one pole, 12-positions to four poles, three-positions. One, two or three decks are available. Wafer is constructed of impregnated glass melamine, with high humidity resistance. Contacts have 1-amp. current-carrying capacity at 50 v. d.c., and 250-ma. current-breaking capacity. **International Instruments Inc., New Haven, Conn.**

Power Supplies

● **Klystron power supply and modulator** provides 50 kv. at 250 ma., with less than 0.05% ripple, operating from three-phase 208-v., 50/60-cps. input. Five separately variable magnet focusing supplies, each rated at 150 v., 4 amp., with less than 0.1% ripple are included. Modulator is designed to operate Eitel-McCullough type of floating-anode klystrons, and has adjustable pulse length in the range of 1 to 100



microseconds, with repetition rates up to 1 kc. Device has built-in monitoring system for both modulator and klystron. Other power supplies are available to operate at different power levels, pulse lengths, and repetition rates. **Levinthal Electronic Products, Inc., 2727 Fair Oaks Ave., Redwood City, Calif.**

● **Regulated a.c.,** Model EE100, can provide 1.4 kva of 115 v., 60-cps. power, regulated to within 1%, and with line distortion of less than 0.3%. Recovery time is quoted at less than 1/50 cycle. Device also provides 4 kva. of 1% power regulated to within 1%, by

means of an electromechanical regulator, where more line distortion and slower regulation can be tolerated. A 230-v. model also is available. **Curtiss-Wright Corp., Electronics Div., Component & Instrument Dept., 631 Central Ave., Carlstadt, N. J.**

● **Regulated d.c.,** Model CS-3667 for use in transistor circuit development, provides three independent continuously adjustable outputs of 0 to 50 v. d.c., at 0 to 10 ma., with less than 1 mv. ripple and 0.5% absolute regulation at 50 volts. Higher current models are also available. **NJE Corp., 345 Carnegie Ave., Kenilworth, N. J.**

Instrumentation

● **High-speed sampling switch** for low-level thermocouple or strain gage signals has five poles with 90 contacts per pole. Average dynamic contact resistance is 1 ohm. Unit measures approximately 3⅝ in. dia. x 6¼ in. long. **General Devices, Inc., P.O. Box 253, Princeton, N. J.**

● **UHF wide-band amplifiers,** Models UH-4(A) and UH-6(A), have center frequency of 400 mc., and bandwidth of 50 mc. Amplifiers employ new GL-6299 tube in lumped constant, triple-tuned circuitry. Power gains available permit amplifiers to be used as intermediate frequency amplifiers or preamps. **Applied Research, Inc., 163-07 Depot Road, Flushing, L. I., N. Y.**

Remote PPI Indicator

Rafax console indicator, part of a narrow-bandwidth system for remote presentation of radar PPI-type information, permits transmission of radar information over telephone lines or radio links. Developed by Haller, Raymond & Brown, Inc., Rafax permits bandwidth compression ratios of 100 or greater. At slowest scanning rate, the required bandwidth is only 300-3,000 cps.

● This new Scott-Firewel miniature Oxygen Regulator system is doing a full-size job on the Douglas A4D "Skyhawk". The "Skyhawk" fulfills a need for lightweight fighter aircraft. This system helps solve giant problems caused by the need for miniaturization.

The regulator is attached to the pilot's standard oxygen mask. Resulting in a 100% saving of valuable panel space. The regulator itself weighs only 1¾ ounces as compared to 4¾ pounds of the standard regulator. A small ⅜ inch mask-hose replaces the regular, bulky breathing tube. These are only a part of the advantages of the new Scott miniature Oxygen Regulator System now available for military and commercial use.

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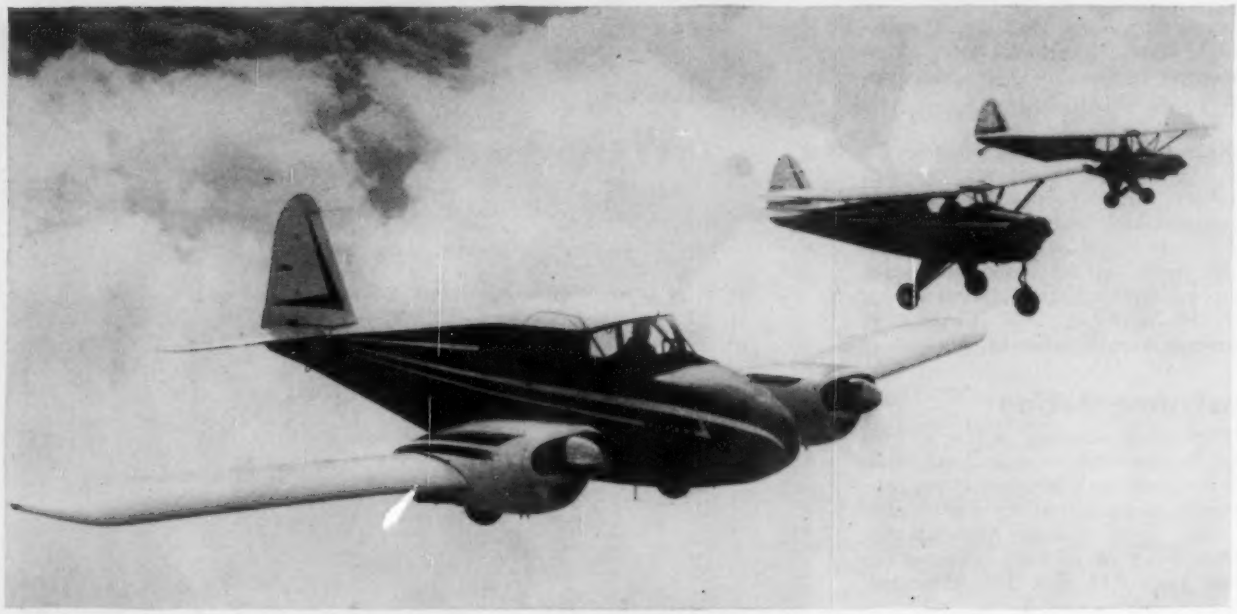

PIPER'S 1956 LINE, left to right, Apache, Tri-Pacer and Super Cub, will be subjects of $30-million sales effort.

Piper Sets Sights on New Sales Peak

By Erwin J. Bulban

Lock Haven, Pa.—Piper Aircraft Corp. challenged its distributors attending the company's 15th annual sales convention here to sell at least $30-million worth of business and utility planes in the coming year—nearly equal to the dollar volume of the entire U. S. private aircraft industry two years ago.

The new sales goal is some 50% higher than 1955's record-breaking performance, during which Piper distributors overshot their $20-million quota by more than $500,000 and more than doubled the previous year's dollar volume of $9.6 million. Plane sales in 1955 included 276 Apaches, 939 Tri-Pacers and 567 Super Cubs.

Reviewing Piper distributor gains, sales manager J. W. (Jake) Miller said that the company had achieved an 800% increase in retail sales in the past seven years. The figures: 1949, $4.2 million; 1950, $4.3 million; 1951, $5.3 million; 1952, $6 million; 1953, $10 million; 1954, $9.6 million, and 1955, $20.5 million.

The more than 200 representatives of domestic and foreign Piper distributors and equipment suppliers were treated to a fast moving, well-rehearsed sales presentation, utilizing films, slides and stage dramatics. Distributors commented that this was the best-staged meeting they had ever attended.

A highlight of the sessions was presentation of slides revealing one of Piper's ace cards for 1957: the new low-wing, all-metal four-place PA-24 Comanche, which will begin flight tests soon (AW Nov. 28, p. 9). Designed to compete directly with the Cessna 180, the new Comanche will supplement the current Piper line, according to Howard Piper, vice president-research and development.

Biggest innovation in the 1956 line is an optional five-seat version of the Piper Apache. The cabin and baggage compartment has been redesigned, with the latter fully upholstered. Incorporation of tracks will take three sliding seats in the aft section. The fifth seat, in the rear, is installed by removing the hat shelf, providing 109-in.-long unobstructed cabin area. With installation of the fifth seat, there is still 12.5 cu. ft. of baggage space. The five-seat package is made by Piper.

Another optional Apache cabin arrangement allows installation of two individually reclining airline-type passenger seats mounted on floor tracks. Again, the hat shelf can be removed to permit full recline. These seats will be available in February. The reclining seats are made by Flight Equipment & Engineering Corp., Miami, Fla.

Apache 1956 prices are up approximately $1,500 because of rising labor and production costs, the company says. The standard model will sell for $34,000; the Custom for $36,790, and the Super Custom for $37,830.

New Tri-Pacer

Most significant improvement in the company's new Tri-Pacer is increased cabin room. This has been gained by moving the rudder pedals forward several inches, giving front and rear

Piper Amphibian

Amphibious floats for the Piper Tri-Pacer are being designed by Edo Corp., following their widespread acceptance by Cessna 180 operators. Some 30 sets of the Edo amphibian gear have been sold to 180 owners and another 50 sets are on order. Over 200 purchasers of the Cessna 180 have paid $500 additional to provide their planes with amphibious capability.

Edo plans to put out five prototype sets of Tri-Pacer amphibian floats next year for field trials and to gather market reaction.

In the meantime, Piper has been flight testing a Tri-Pacer, with its 29.3-ft. wings replaced by 35.3-ft. Super Cub wings. Initial trials have shown the modified landplane takes off in the same distance without flaps as the shorter-wing Tri-Pacer does with flaps and drag losses are said to be negligible.

occupants additional leg room. Front seats are now individually adjustable over a 5-in. range, permitting staggering to give more shoulder room.

Instrument panel has been completely revised to put flight instruments on the left side, radios in the center and engine group on the right. Center grouping of radios makes it easy for the right-seat occupant to work this equipment while the pilot is flying. Instrument panel is black, to improve instrument night visibility. A removable panel has been added to the top of the panel this year to allow easy access to the instruments.

A Hartzell constant-speed propeller has been approved for the Tri-Pacer as optional equipment to replace the standard Sensenich propeller, at approximately $1,000 extra.

New Tri-Pacers cost approximately $475 more than the 1955 models: $7,295 for the standard; $7,895 for the Custom, and $8,895 for the Super Custom. The factory says that of the three models, it has been selling approximately 85% Super Customs.

The new Super Cub PA-18 trainer and PA-18A agricultural plane are virtually identical to previous models.

Merchandising Program

In outlining the high-powered merchandising program planned for the coming year, Miller told distributors: "We have passed through grammar school, high school and college—our whole future lies ahead of us."

The program for the first time will place heavy emphasis on the twin-engine Apache, which has been largely responsible for building the company's dollar volume. The company is rushing to completion a 60,000-sq. ft. addition to its production plant to increase Apache output to two-a-day by mid-winter (AW May 16, p. 58).

PA-24 COMANCHE is Piper's ace-in-the-hole for 1957. Aimed at the Cessna 180 market, the new all-metal Comanche will carry four people at a cruise speed of about 160 mph.

Piper's 1956 sales program includes:

- **Increasing the advertising budget** to $150,000, which is $50,000 higher than 1955. Advertising schedules are being placed mainly in businessmen's and farm publications with subscribers in the $10,000-a-year-plus income bracket. Combined readership of these publications is estimated at over 50 million.
- **Television commercials** on local stations by dealers and distributors using company-prepared one-minute films. Initially, Piper has made three of these spot commercials featuring Jack Gregson, sports announcer, who is also a Tri-Pacer owner. Piper will also distribute to sales personnel, local TV stations and business groups five 27-minute educational color films, which show Piper planes at work and in production, including "Wings for Adventure," made by William T. Piper, Jr., and Howard Piper during their 12,500-mi. delivery flight of an Apache last spring from Lock Haven to Pretoria, South Africa.
- **Increased emphasis** on a "travel while you learn" plan, in which distributors teach a businessman prospect how to handle the controls, read maps and use radio aids during charter flights. Piper distributor Bill Mueller, of El Paso, Tex., told AVIATION WEEK that he now makes most of his sales using this technique, soloing prospects in about 18 hours. Mueller is one of Piper's 18 "quota-busters" this year.

The sales department emphasized that demonstrations should stress what the prospect can do with the airplane —not the ability of the distributor's pilot.

APACHE FIVE-SEAT LAYOUT will be a major selling point in 1956. Fifth seat goes in upholstered baggage compartment. Another version has two full-reclining passenger seats.

Dealer Follow-Up

A must for repeat sales is the follow-up, whereby the distributor thoroughly checks the customer out in his new equipment. One of the most successful patterns has been found among distributors who take the customer to the factory to pick up his new airplane and then ensure that he is checked out no matter how many flying hours the customer has.

There are too many cases where customers are not getting the fullest utility out of their airplanes, Piper spokesman said, because distributors do not make sure that the owner is fully briefed on how to work all of the equipment installed, particularly items like

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NEW TRI-PACER CABIN is roomier than previously. Front seats slide forward and rearward. Radios are grouped in center of panel for easier handling, flight instruments on left.

omni range and other navigation gear. The dealer's goal should be to check the customer out so that he receives his full value for money invested, distributors were told.

Field Service Plan

An important part of keeping close tab on Piper owners and building their confidence in dealers will be a new field service plan that will develop a network of factory-authorized service stations. Factory-approved service facilities are a must in the modern aircraft merchandising plan, the distributors were told, because customers have been educated on other high-cost products to expect manufacturer-provided service back-up.

From the distributor viewpoint such facilities are also a definite money-maker, particularly with the advent of the more complex Apache twin, which is reaching the field in increasing numbers. There are now more than 355 of these Piper twins in use.

Piper's sales department noted that last year spares shipments to distributors totaled well over $600,000, compared with $454,000 the previous year. This rising trend will be a significant source of dealer income in the future, the company says.

To help distributors develop service techniques, Piper is setting up a mechanics' school at the factory, with the first class of 10 scheduled to take the one-week course beginning soon after the start of the year.

The Big Ten

At the annual sales banquet, Piper awarded its traditional "top hat" to the 10 top distributors and to Jonas Aircraft & Arms, which handles export sales. Jonas distributed 198 Piper aircraft this year.

The top 10, with numbers of planes sold: John Baker, Baker Aircraft Sales, Long Beach, Calif., 155; Art Whitaker, Portland, Ore., 82; Les Longbrook, Combs Aircraft, Inc., Denver, Colo., 69; George Edgcumbe, Tufts-Edgcumbe, Inc., Elmhurst, Ill., 68; Roy Neal, Wes-Tex Aircraft, Lubbock, Tex., 63; Lloyd Brown, Brown Flying Service, San Antonia, Tex., 55; O. P. Hebert, Safair Flying Service, Teterboro, N. J., 46; Dick Batten, Oklahoma Aircraft Sales, Ponca City, Okla., 45; Angelo DePonti, DePonti Aviation Co., Minneapolis, Minn., 43; Clyde Shockley, Muncie Aviation Corp., Munice, Ind., 43

AC Plugs Will Enter Civilian Plane Market

General Motors Corp., one of the nation's largest users of business planes, has assigned its AC Spark Plug Division, of Flint, Mich., the task of capturing the corporation aircraft market from Champion and BG. As a start in this direction, the division plans to make a plug to suit every engine, old and new.

Long identified as a military supplier of plugs, AC's is entering the civilian field in hopes of leveling out sales peaks and valleys, AVIATION WEEK was told at the first AC spark plug clinic held for corporation plane operators and service personnel. The meeting, sponsored by Airwork, Inc., Millville, N. J., an AC distributor, was held at the offices of one of Airwork's Class A dealers, International Aviation,

TIMKEN® bearings in new DC-7 wheels take 61-ton wallop at 100 mph

EVERY wheel bearing in Douglas Aircraft Company's new DC-7 has to be able to take the tremendous shock load of over 1,000 landings a year—without even the slightest chance of failure! That's why Goodyear engineers mounted the wheels for this plane on Timken® tapered roller bearings.

Timken bearings can handle shock loads like this because they're hard on the outside, tough on the inside and made from our own steel. We're America's only bearing manufacturer that makes its own steel. It's the only way we can assure durability and quality in every bearing.

Even in a cross-wind landing, Timken bearings can take the sudden thrust load with ease. Their tapered construction enables them to take thrust as well as radial loads. And the wide line contact between rollers and races gives Timken bearings load-carrying capacity to spare.

Other Timken bearings in the brake installations minimize wear and maintenance. The true rolling motion and incredibly smooth surface finish of Timken bearings practically eliminate friction.

To get all these advantages in the equipment you build or buy, always specify Timken bearings. And always look for the trademark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

How **GOODYEAR AIRCRAFT CORP.** mounts the landing wheels of the new Douglas DC-7 on Timken bearings to assure long life, trouble-free service under heavy shock loads.

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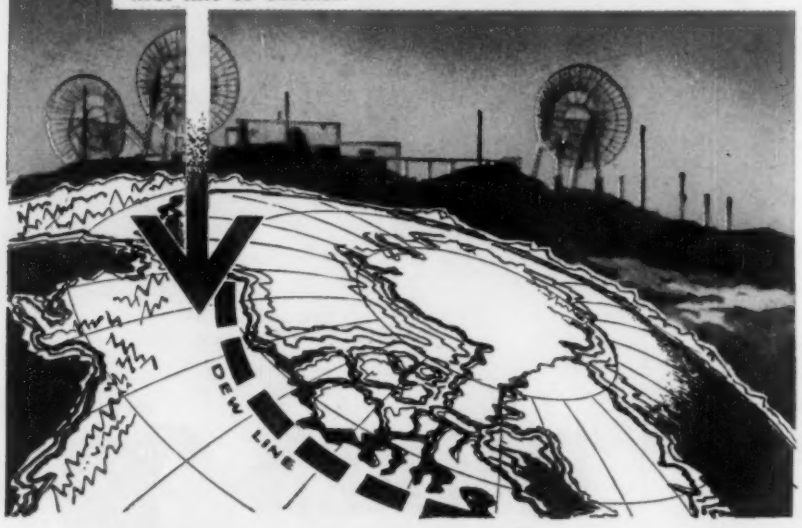
NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↕ AND THRUST ↔ LOADS OR ANY COMBINATION ✳

Piasecki H-21 Work Horse helicopters are playing an indispensable part in building and servicing early-warning Arctic radar and communication stations.

Daily, H-21's are ferrying construction personnel and tons of equipment to remote mountain top sites. This **peak service** is providing a vital third dimension in transportation for America's first line of defense.



Piasecki helicopter corporation
MORTON, PENNSYLVANIA

ENGINEERS NEEDED: *Send resume to Employment Representative*

Inc., Westchester County Airport, N. Y.

Because of the encouraging turnout at this initial session, it is expected that similar forums will be held by the manufacturer's other distributors.

Spark plug deposits can be burned off during engine runup by gradually advancing throttles in increments and staying just below engine miss, pilots were told by Earl Pierce, AC project engineer. An important factor in preventing pre-ignition is to use torque wrenches in plug installation. A common fault is to install plugs too tight, bending threads and resulting in serious leakage of gases.

AC invited customers to send plug problems to the plant for detailed engineering analysis.

PRIVATE LINES

A new distributorship pattern is being developed by Lycoming Division of Avco Manufacturing Corp. to improve present field service facilities for the firm's engines. The new program is being geared to fewer but more elaborate service shops capable of handling all types of Lycoming powerplants used by business pilots. Dealers probably also will be expected to maintain credit ratings with the factory, since Lycoming desires to end cash-on-delivery shipments.

Edo Corp. also is expected to revise its float sales procedures in the near future. Factory sales program is expected to be replaced by appointment of approved business plane distributors as sales outlets for Edo floats.

FA-3 Airphibian roadable airplane, developed by Continental, Inc., Danbury, Conn., is on a cross-country tour aimed at selling the project. The original firm has been dissolved and its assets are held by a former stockholder. Frazer Dougherty, former Continental, Inc., vice president-test pilot, is demonstrating the FA-3 on the current tour, during which he expects to visit Piper, Cessna, Beech, Aero Design & Engineering and other firms.

Canso PBY-5A amphibian fitted as a flying geophysical laboratory will make extensive electro-magnetometer surveys over Central and South Africa early next year. Aeromagnetic Surveys, Ltd., Toronto, Canada, is operating the plane.

Private ferry organizations are enjoying a boom because of the continued rise in business plane production. Ferry Service Co., Lock Haven, Pa., and Wichita, Kan., told AVIATION

WEEK that it is now delivering to distributors about 40% of Piper's production and about 10% of Cessna's. Firm now employs 10 full-time and 25 part-time pilots.

Royal Gull appointment: Timmins Aviation, Ltd., Montreal Airport, Dorval, has been named as Canadian representative by Royal Aircraft Corp., Milwaukee, for the twin-engine business amphibian.

Santa Rosa Airpark, Calif., has been purchased by Codding Enterprises, Inc., for immediate development into a business plane service center. Codding Enterprises is capitalized at $100,000. A large hangar, gas service and runway lighting are among the improvements planned.

Babb Co., Phoenix, Ariz., has purchased the $970,000 inventory, mainly DC-3 equipment, from H & E Aircraft Co., Oklahoma City, and has acquired the 95,000 sq. ft. former Pacific Airmotive engine overhaul facility at Linden, N. J. Babb, a subsidiary of Atlas Corp., will move the Oklahoma City inventories to Phoenix.

Need for information quickly on causes of aircraft accidents was major point stressed by business plane pilots during first meeting of Flight Safety Foundation's corporate aircraft members. More than 30 pilots were present at all-day session, directed by Randall Carpenter, who heads FSF's new corporate aircraft activity (AW Sept. 12, p. 83). The Foundation, with offices at 471 Park Ave., N. Y., now has over 50 corporate members.

Fixed wing planes belonging to N. Y. C. Police Department are being disposed of because of greater suitability of the department's helicopter. NYPD is asking bids on a 1944 Grumman G-21A Goose and a 1942 Grumman G-44 Widgeon, with spares. Interested parties can contact Department of Purchase, Salvage Division, Municipal Building, New York 7, N. Y. for bid proposals, which will be opened November 23.

CAA must be notified when owners sell their airplanes, according to a recently effective regulation, which is designed to offset previous difficulties in establishing legal title to aircraft. Burden is on the seller to immediately notify CAA of the transfer; the new owner must mail the government agency a completed application for registration form, a bill of sale or other evidence of ownership and a four-dollar registration fee before he can fly his airplane. These details are handled by the Civil Aeronautics Administration, Administrative & Records Branch, W-240, Washington 25, D. C.

SIX PICTURE WINDOWS in Tropicana DC-3 conversion provide wide vista

DC-3s With Regional Interiors Planned by Miami Aircraft Firm

A new series of DC-3 business-plane conversions especially styled to suit the geographical tastes of the customer are scheduled to be produced by L. B. Smith Aircraft Corp., Miami International Airport, Fla.

The conversion center is now demonstrating its first model, called the Tropicana, reflecting the atmosphere of the Southeastern U. S. in its interior furnishings.

Other models will have interiors to fit the moods of residents of New England, metropolitan cities and the West. This custom styling has been developed by the industrial design firm of Charles Butler Associates for L. B. Smith.

The Tropicana conversion sells for approximately $200,000. It is basically a DC-3 having an 8,000-hr. overhaul, with zero-time Wright R1820-72AM-1 engines developing 1,350 hp. Zero-time Hamilton Standard full-feathering propellers are fitted.

The paddle-type propellers are mirror finished.

At a gross weight of 26,200 lbs., the airplane can cruise at approximately 210 mph. true airspeed. With 15 passengers, the range is about 1,300 mi. Fuel tankage is 822 gal.

A primary design feature is the installation of four 17-in. x 56-in. and two 17-in. x 30-in. picture windows in the passenger cabin, supplemented by six normal-width windows lengthened to 17 in.

The interior designer has broken the cabin area into four distinct work and rest areas with patterns of furnishings and colors to alleviate the normal tunnel-look.

The forward lounge is separated from the cockpit by a fully-transparent panel, which allows passengers to watch the pilots operating the plane without having to enter this area. Behind the lounge is a sleeping area with a couch which converts into a bed seven-foot long and 33-in. wide.

Cocktail and conference areas are in the rear of the cabin. Bar, buffet, magazine racks and other service furnishings are carried along the port side of the cabin.

In the rear, there are four swivel chairs with folding tables. Seating is built by Aerosmith, an L. B. Smith division.

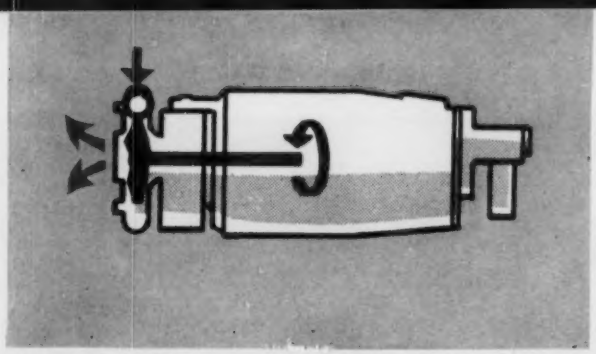
The cockpit has contoured adjustable foam-rubber cushioned pilot's seats.

VHF equipment for the converted plane includes Bendix TA18BB 360-channel 25-w. transmitter and Bendix RA18C receiver, ARC-1 50-channel transceiver. Omni gear comprises two 51R2 VHF receivers, an MN97 omnimag, and R89B glide slope 10-channel system and an MN-100A glide slope receiver.

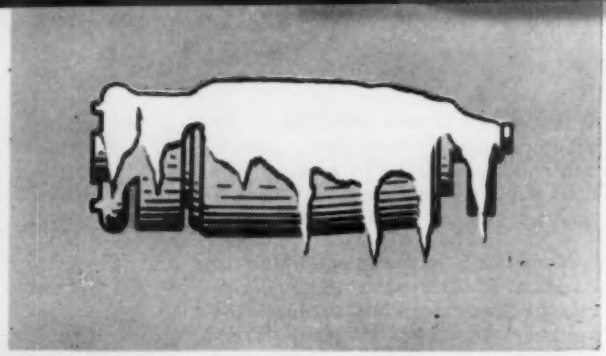
Two Bendix BC 433M receivers and units make up the ADF layout. Radio and electric controls are consolidated on an overhead panel. All radios can be individually controlled by toggles over each pilot's seat. Standard instrumentation includes a Sperry Gyrosyn C-4 compass.

The radio gear is concealed in seats and lounges behind the cockpit area. A thermostatically-controlled blower can cool the radio equipment on the ground, if necessary.

L. B. Smith also has worked out an optional electric-hydraulic landing gear and flaps actuation system with two toggle switches on the central pedestal, making it unnecessary for pilots to reach back to actuate these items.

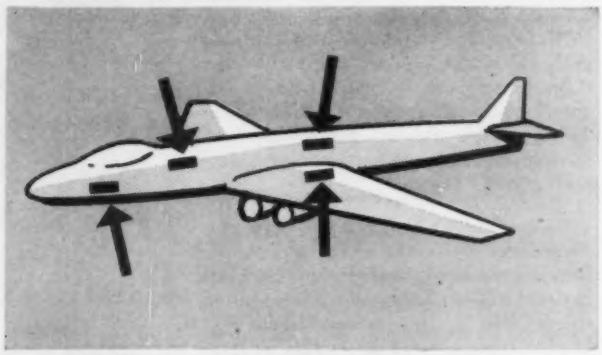


1. RELIABILITY: Fewer moving parts help assure more dependable operation.



2. FLEXIBILITY: The G-E Pump will operate up to 55,000 ft. altitudes.

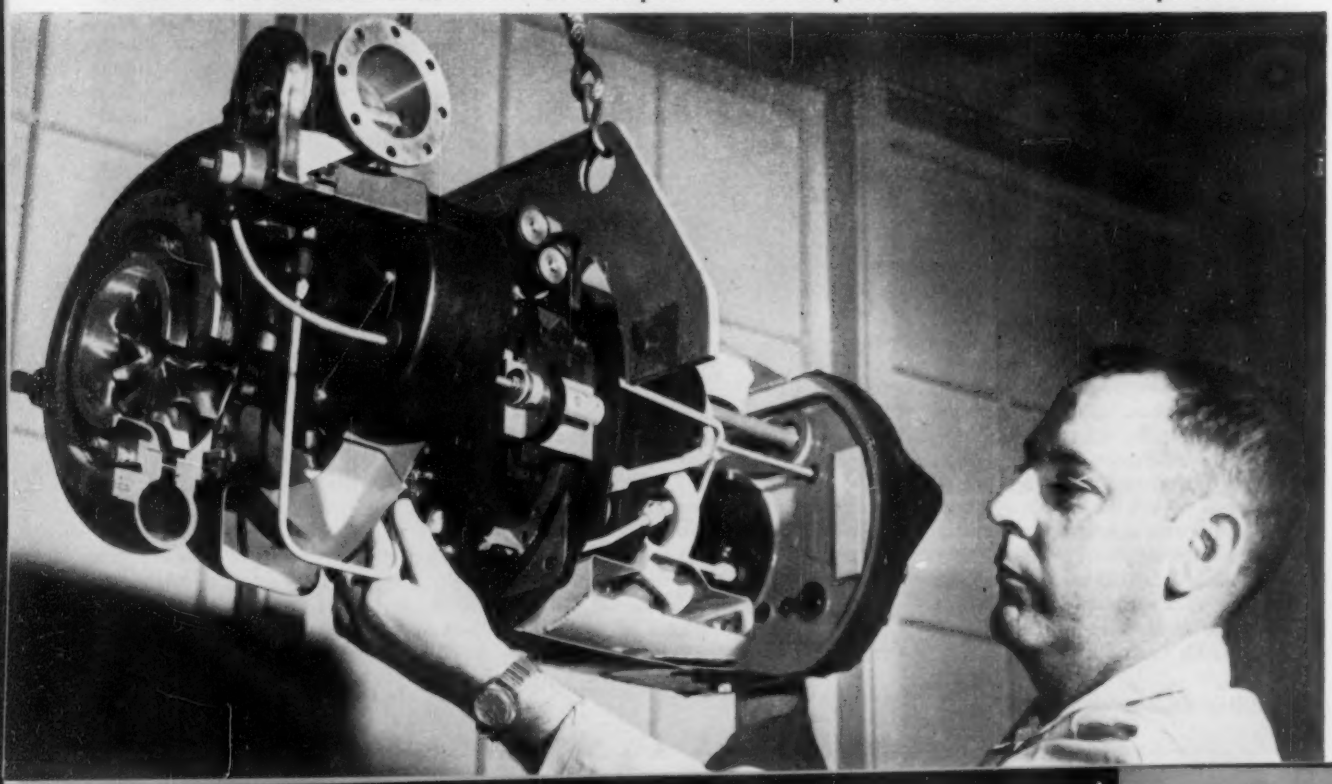
5. NO PAD SPACE NEEDED: Reduced engine frontal area permits smaller nacelle size.



6. FUNCTIONAL LOCATION: G-E turbopumps can be located close to power requirement.

8 ways G-E Hydraulic give your aircraft greater

The G-E Pump is a completely self contained unit with its own control system and integral hydraulic reservoir. The inlet duct is assembled in three positions to permit air supply from three directions relative to a fixed reservoir position. This feature helps the Pump meet varied installation requirements.



3. AUTOMATIC: Completely self contained, self lubricated and automatic in operation.

4. EASIER MAINTENANCE: Equipment changes can be made without removing the main engine.

7. IMPROVED AIRCRAFT PERFORMANCE: System's light weight increases speed, climb rate, range.

8. PROVEN BY QUALIFICATION TESTING: Can meet requirements of your aircraft.

Turbopumps can help availability, better performance

General Electric's new Hydraulic Turbopumps are now available to give you the eight benefits illustrated above in furnishing auxiliary power for your aircraft. Designed to operate at almost any location within the plane's structure, the G-E Pump can be used to supply power for such hydraulic requirements as raising and lowering the landing gear, steering, opening and closing bomb-bay doors, maneuvering wing spoilers, and empennage surfaces.

Designed for efficiency—These G-E Pumps operate on the simplest of principles. Turbine wheels in each unit spin on streams of air extracted from the jet engines. The turbine wheel shafts then drive the constant speed variable displacement hydraulic pumps. This system eliminates the problems of bulk associated with direct drive systems. Expensive maintenance procedures are also unnecessary because a mechanic can easily get to each drive inside the plane. Their remote locations eliminate the weight of long transmission lines, and ground test operation is possible without operating the main engines.

Greater aircraft availability: G.E.'s Hydraulic Turbopumps have been proven in operational testing. It has been designed for faster, easier installation, and greater accessibility in maintenance. These inherent features add up to greater availability for your aircraft.

Can meet your requirements—Designed to meet the toughest conditions that might be encountered in flight today, current models can operate up to 55,000 feet. Potential operational altitude is almost limitless. For more information on how General Electric can help you meet your auxiliary power demands, see your nearest G-E Apparatus Sales representative, or write for bulletin GEA-6333. General Electric Company, Section 231-4, Schenectady 5, N. Y.

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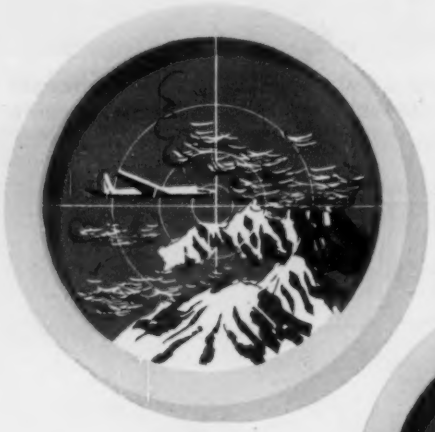
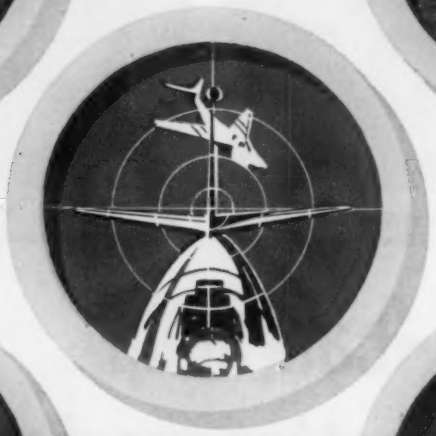


TERRAIN CLEARANCE RADAR

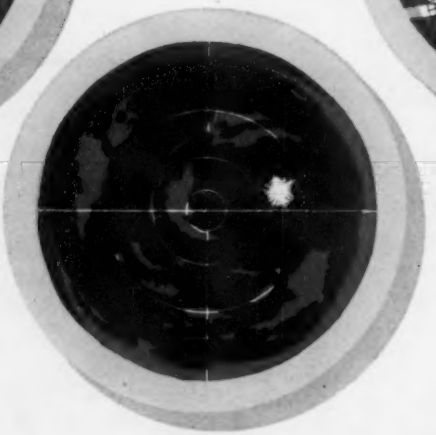
NAVIGATIONAL RADAR



TAIL-WARNING RADAR

MISSILE GUIDANCE

MAPPING RADAR



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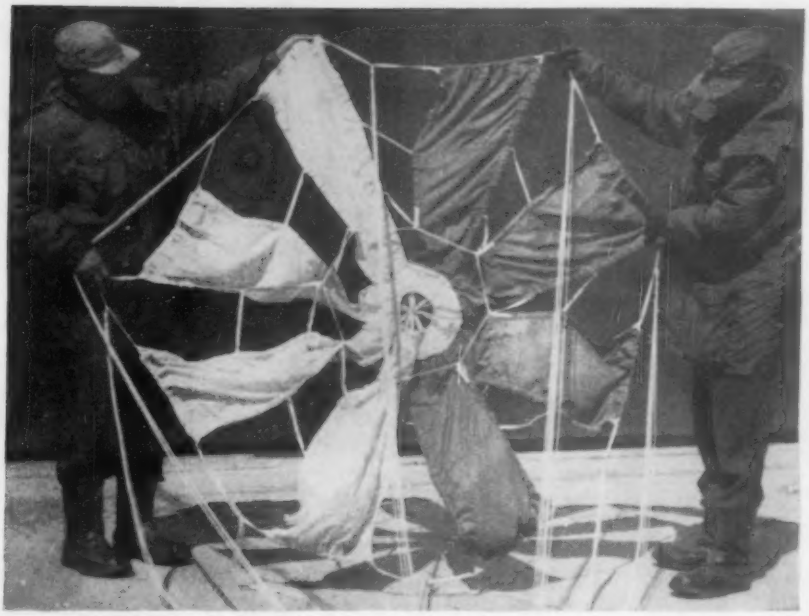


FULL-SCALE MODEL of repeating parachute held by NAE scientists at Ottawa.

'Repeating' Parachute Increases Airborne Cargo Drop Accuracy

A new type of parachute that may greatly increase the accuracy of cargo drops has been developed by scientists at Canada's National Aeronautical Establishment in Ottawa.

Known as a repeating parachute, the new unit can be made to open, rotate, wind up its shroud lines, close, unwind and open again. This process can be repeated a number of times in one drop.

The advantage of the repeating behavior is this: When the cargo is dropped, the parachute opens to destroy forward momentum; then it winds up and closes, providing a period of fast vertical descent; near the ground it opens again, providing a cushioned landing in the target area; on the ground it collapses, so there is no dragging of load.

The parachute itself consists of a number of gores, or panels, forming a slotted canopy with shroud lines leading to a control ring.

It is built so that the gores have a small tilt angle, which causes the parachute to rotate clockwise rapidly as it inflates, winding up the shroud lines. The control ring is attached in such a manner that it reverses the tilt when the canopy is fully inflated, "spilling" the chute and making it turn slowly in the counter-clockwise direction. When the canopy deflates, the control ring sags and the original gore tilt becomes effective again, filling the parachute again and restoring the original clockwise motion.

The number of open-close cycles for a given altitude and load is controlled by appropriate design.

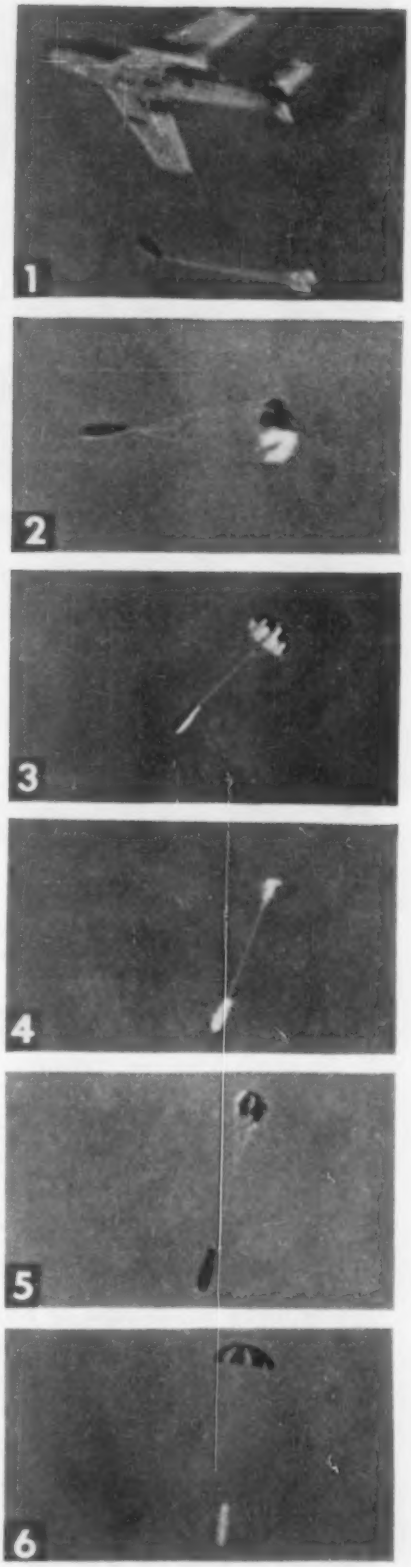
Carried by the Wind

The new parachute overcomes a number of problems which previous techniques solved only imperfectly. The major source of error in parachute drops is unpredictable shifting of the wind. Time of descent must be made as short as possible to minimize the wind's effect.

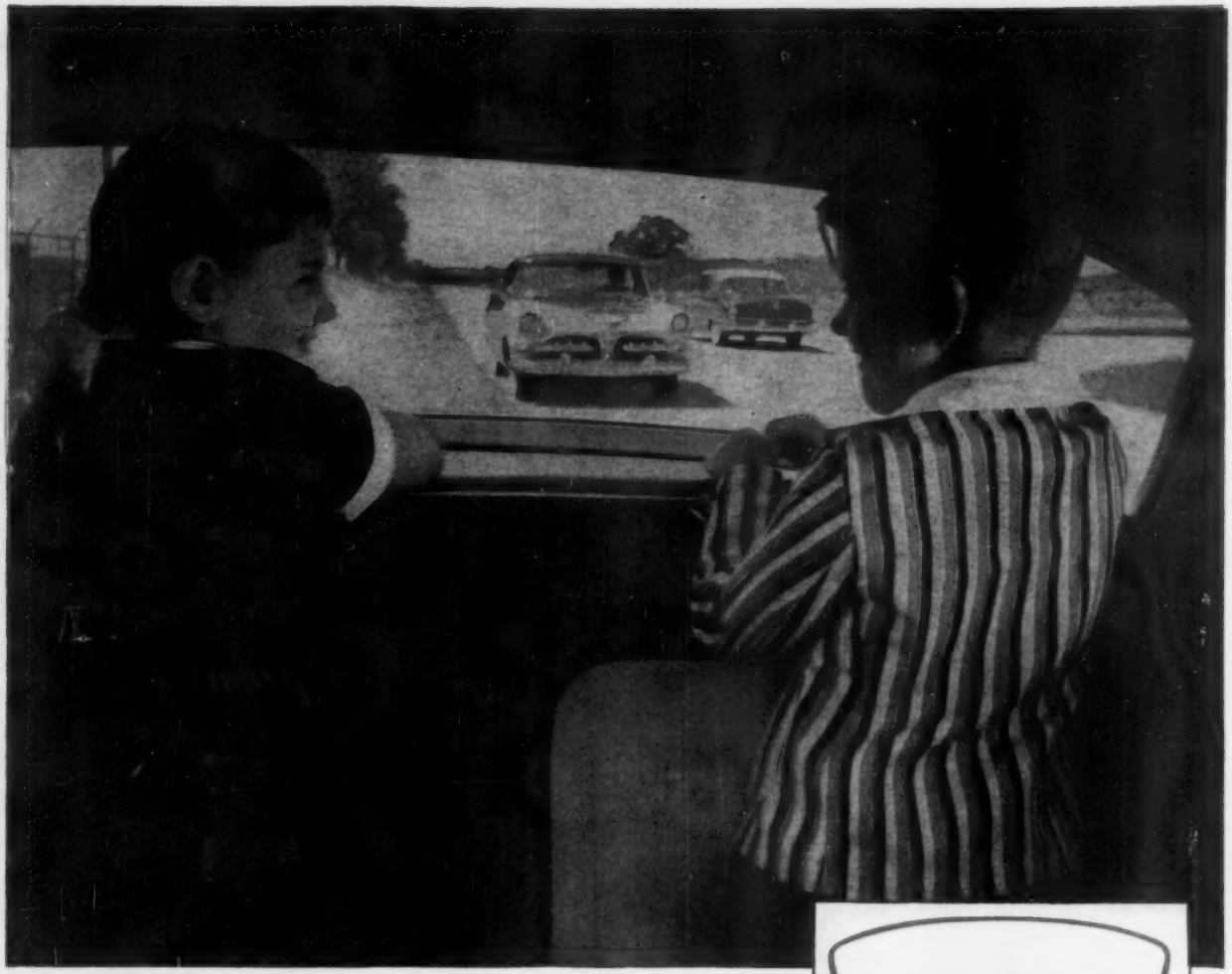
One method is to use a conventional chute small enough to drop the load very rapidly. The landing, however, is likely to damage the cargo extensively.

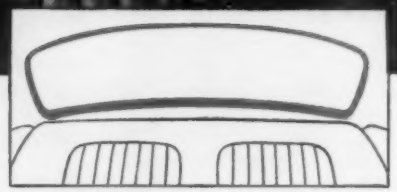
Another technique is to use a delayed parachute, which opens in time to cushion the landing, but this introduces large errors because it demands aiming so far ahead of the aircraft that the sighting angle is a shallow one (something that is especially troublesome in rolling terrain).

A refinement of the delay technique



REPEATING PARACHUTE dropped from aircraft traveling at 285 mph.: 1) ready to open, 2) opened, 3) ready to close, 4) closed, 5) ready to reopen, 6) reopened.





Dodge selects Enjay Butyl rubber for big rear-window weatherstrip

Super-durable Enjay Butyl fits perfectly Dodge's rigid specifications for its rear-window weatherstrip. Under the toughest conditions of weather and use, Enjay Butyl parts stay like new, help add style and color to new cars. In fact, some automobiles have more than 100 parts made of this fabulous rubber.

The many advantages of Enjay Butyl make it the almost perfect rubber for the automotive industry. Its price and ready availability are advantages, too. And it is now available in non-staining grades for *white* and *light-colored* parts. For full information and for skilled technical assistance in the uses of Enjay Butyl, contact the Enjay Company at either of the addresses below.

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Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

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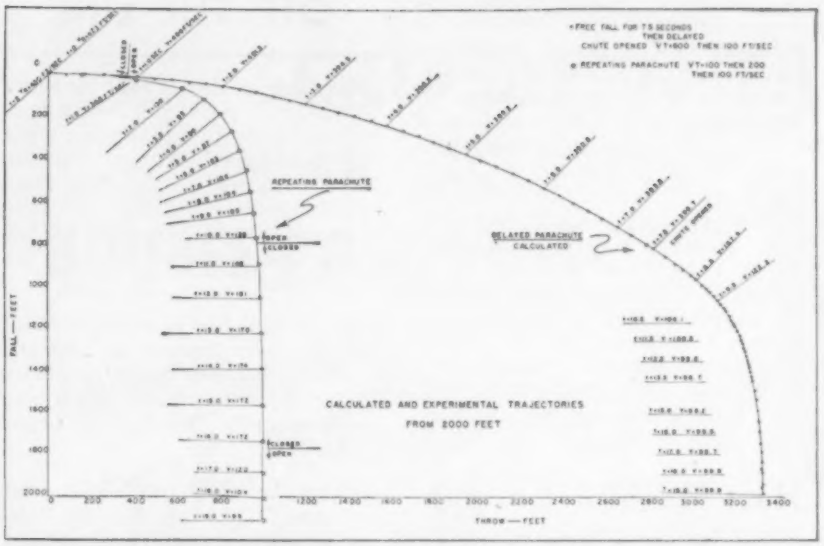

ACCURACY OF REPEATING CHUTE is shown in graph comparing experimental drop at 285 mph. from 2,000 ft. with calculated trajectory for delayed parachute.

is the use of two parachutes. The first destroys momentum in the line of flight and is then disconnected, permitting rapid vertical descent. The delayed parachute opens in time for a gentle landing. This system requires the use of two parachutes, two time delays and heavy parachute release mechanisms.

The repeating parachute replaces all of these items with a package whose bulk, weight and reliability are comparable to that of a single conventional parachute, NAE's researchers say.

Mathematical Theory Developed

A mathematical theory of rotating and repeating parachutes has been developed by NAE's H. T. Stevinson, head of the special projects group of the Flight Research Section, P. Mandl, associate research officer of the Aerodynamics Section, and R. J. Templin. This makes it possible to design chutes for various loads, altitudes and numbers of open-close cycles.

NAE says that a Frenchman, Ehmig, in 1948 patented a rotating parachute (with radial slots) which was supposed to wind up its shroud and collapse on landing. However, NAE's researchers say, the first known repeating parachute model was operated by Stevinson in 1951.

The model was made by cutting radial slots in a small conventional parachute. It was attached to a flywheel being towed rapidly by a vehicle.

In the course of towing experiments, four modes of operation were obtained: open and remain open; open, close and remain closed; open, close, reopen and remain open; open, close, reopen and repeat several times.

Other tests were made using a crossbow to launch model chutes, and finally high-speed drops were made from aircraft. A few short tests also were made in the National Research Council's wind tunnel in Ottawa.

During the three years of tests, 28 experimental chutes were produced and tried out in 1,682 towing tests and 64 drops from aircraft. From the tests, NAE's scientists were able to pinpoint the effects of variables such as gore shape and size, porosity of parachute material, length and design of shrouds, and weight and moment of inertia of the rotating load.

The last 10 chutes produced were from a frozen design in half-scale, full-scale and 1½-scale models, with two different cloth porosities.

Details of the parachute development and theory are contained in an NAE report, "A Repeating Parachute," written by Stevinson and Mandl.

NATA Outlines Plan To Improve Standards

National Aviation Trades Assn. has established a program to improve maintenance operations and standards to serve the aircraft user and the military establishment under contract. The program was approved at NATA's 16th Annual Convention in Phoenix, Ariz., and will be handled through the new NATA Maintenance Council.

Other actions of the convention included authorization for:

- **Support** of the aviation incentive movement proposal for youth and flight scholarships program for Civil Air Patrol cadets and ROTC flight training legislation.
- Increased backing of NATA efforts to

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HUGHES TOOL COMPANY AIRCRAFT DIVISION

in Southern California,

is expanding its research and development activity in a variety of commercial and military fields including helicopters, rockets, missiles, armament, electronics, etc. These long-range projects have created exceptional opportunities for Engineers and Scientists in the following fields:

Engineers

AIRCRAFT MECHANICAL DESIGN;
AIRCRAFT STRUCTURES DESIGN:
At least five years responsible aircraft design experience required. Experience in design and development of helicopter rotor blades, hubs and transmissions helpful.

HIGH-SPEED MECHANISM DESIGN:
Experienced in design and development of mechanical, electrical, hydraulic, or pneumatic devices. Analytical ability essential.

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Analytical ability and experience with hydraulic and pneumatic valves and regulators required.

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HUGHES TOOL COMPANY AIRCRAFT DIVISION

Culver City, Los Angeles County, California

improve various aspects of the aerial dusting industry.

• **Continued work** toward gaining improved operator leaseholds and expanded tenures on public airports.

• **Establishment** by NATA of Eastern, Central and Western Air Space Committees.

Officers of NATA elected for the coming year are: president, Sam Freeman, Somerset Airport, Bedminister, N. J.; eastern vice president, J. D. Finger, Westchester Airport, Armonk, N. Y.; western vice president, Galen Bertram, Southwest Kansas Aircraft Sales, Greensburg, Kan.; treasurer, John C. Bennett, Jr., Louisville Flying Service, Louisville, Ky.; and executive director, Charles A. Parker.

Hart Machine Co. Sold

Hart Machine & Manufacturing Co., tool and die machine shop in Denver, Colo., has been acquired by Frank R. Cook Co., also of Denver.

The shop will be expanded to include production of aviation and electronic equipment and operated as a division under Walter N. Lundahl, former chief of the advanced flight control design section of Minneapolis-Honeywell Regulator Co.'s Aeronautical Division.

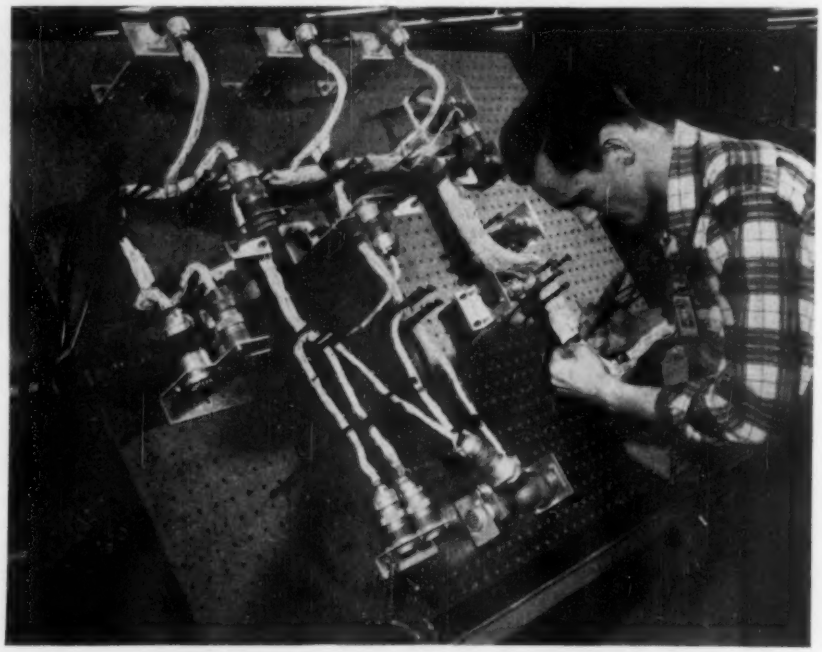
OFF THE LINE

Adkins relative danger light for aircraft (AW, Oct. 3, p. 78) will be distributed by Van Dusen Aircraft Supplies (offices in Minneapolis, Chicago, Teterboro and Washington, D. C.). Van Dusen is demonstrating the light on several of its sales aircraft. The light has been put into production by Research, Inc., Minneapolis.

Link Aviation has received an $8-million Air Force contract for additional F-102A supersonic flight simulators. The company delivered its first F-102A simulator earlier this year to Tyndall AFB.

Officine Aeronavali of Venice, Italy, will rebuild C-46 aircraft under Riddle Airlines' CAA-approved type certificate and specifications. The work will be done for European and Middle Eastern carriers. The Riddle certificate provides for operation of the planes at 48,000-lb. gross in cargo service and 45,300-lb. in passenger service.

Precision Rubber Products Corp., Dayton, has developed a testing device which determines the temperatures at which synthetic rubber or other resilient



Kit Speeds Instrument Assembly

Do-it-yourself kit, patterened after an Erector set, reportedly cuts cost and speeds assembly of short-production-run aircraft control instruments. Developed by the Aeronautical Div. of Minneapolis-Honeywell Regulator Co., the kit consists of various-sized sheets of perforated fiberboard, perforated metal sheets and strips and an assortment of angle brackets, binding posts, stand-off legs, clamps, wing and hex nuts and bolts. The kit can be used in assembling tools, mounting panels and other fixtures for as little as one-tenth the cost of permanent engineering design and tooling. When tests are completed, unit can be torn down and parts re-used.

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ACTUAL SIZE

New ELECTRO SNAP

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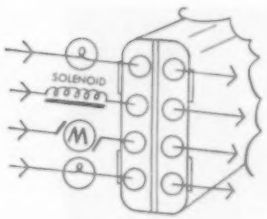
Seals Out Moisture, Dirt, Oil, Corrosion, Condensation from Temperature Cycling

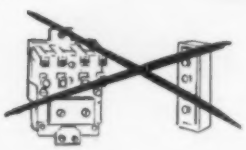
With switch mechanism hermetically-sealed in a dry, inert gas, switch is dependable at any altitude, moisture or temperature condition. Use it on aircraft, machines where oil is a problem, in areas subject to freezing or extreme heat or corrosive atmospheres.

Controls FOUR Circuits with ONE Snap



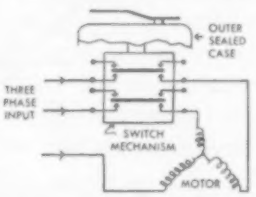
Eight separate contacts and terminals permit many unusual circuit combinations. May be wired externally for D.P.D.T., 2 circuit; D.P.S.T., normally open; D.P.S.T., normally closed. Movable poles may also be wired externally in series to increase current capacity of switch or number of contact breaks for high voltage switching.

Eliminates Expensive and Bulky Relays, Extra Switches



J2-4 can control circuit combinations that were formerly possible only with complicated relays or a number of separate switches. Saves money, weight and space.

Starts, Stops or Reverses Three-Phase Motors



Simultaneous action of two movable poles permits switch to break or reverse current flow through two windings of a three-phase motor. Movable poles are interlocked by unique design of switching mechanism, eliminating need of adjustment.

SPECIFICATIONS

Electrical Rating—10 amps @ 125/250v AC/ 30v DC Ind.

Operating Force—3½ lbs.

Weight—2½ oz. (4 oz. with actuator)

TOGGLE ACTUATOR (constant or momentary contact) can be furnished on switch. Fits AN-type toggle switch mountings.

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Please send full information on new J2-4 Hermetically-Sealed Simultaneous Double-Pole Switch.

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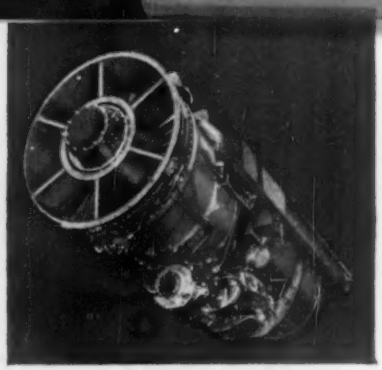

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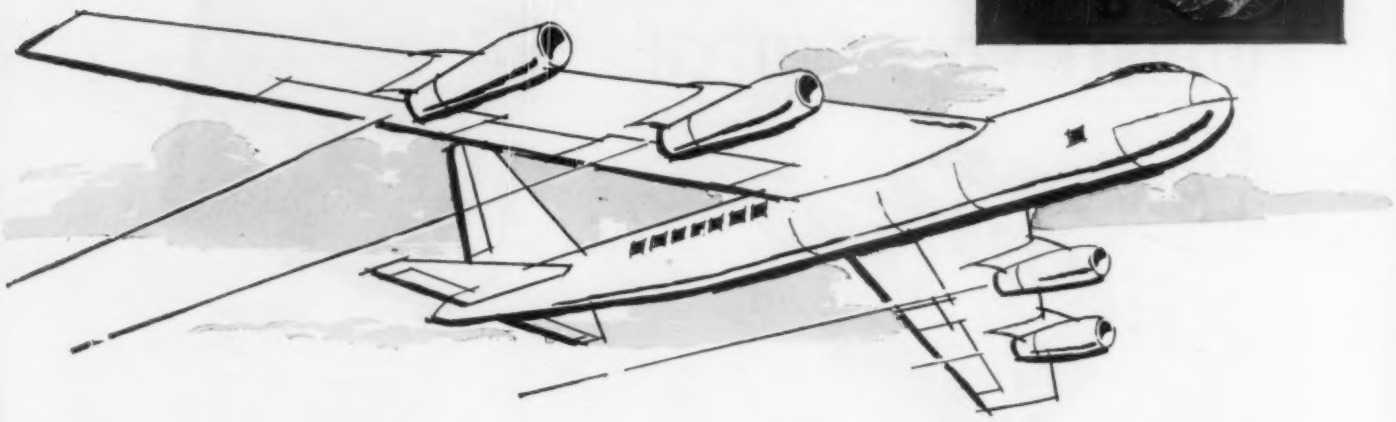

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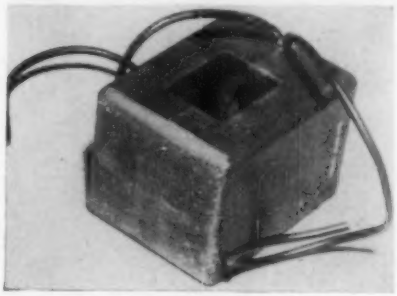
materials recover their elasticity after being frozen solid. Tester is being used to establish low-temperature characteristics of the company's aeronautical O-rings.

Molding submerged pump solenoids for Navy aircraft catapults in Bakelite epoxy resin protects the electrical insulation of the units from chemical attack. This technique became necessary when



Navy switched catapult systems from oil to hydrolubes, which attacked the insulation and shorted the coils.

Monsanto Chemical is expanding its oil additive research program to include additives for jet and piston aircraft fuels.

Air Conditioned S-59

An air conditioning system has been installed in the new Sikorsky S-59 jet-powered helicopter by AiResearch Manufacturing Division of Garrett Corp.

The air cycle refrigeration system utilizes a small 2-lb. turbine unit, yet has a cooling capacity equal to that of 35 household refrigerators, the manufacturer says. Its light weight and compactness make it readily adaptable to the requirements of the S-59.

With the increasing use of helicopters in passenger service, it is expected that air conditioning will become standard equipment AiResearch says.

Piasecki Sub-License

The Piasecki Helicopter Corp. has signed a sub-license agreement with Turco Products, Inc. to use the new Chem-Mill Process, thus becoming the first helicopter manufacturer licensed to use this process. Other major aircraft companies have also signed Chem-Mill sub-license agreements.

Ex-Cell-O Expands

Additional production facilities have been acquired by Ex-Cell-O Corp., Detroit, Mich.: a 66,000-sq.-ft. plant at Elwood, Ind., and a 15-acre-plant site at Downey, Calif. A 60,000-sq.-ft. facility will be built at the latter site.

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Reverse Bend
Uniformity
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Pressure (Tubing)

no undercut

in new type welded stainless steel pipe

Now, TRENTWELD is better than ever! Thanks to Trent's new patented *Contour-Weld** process, you can now get stainless pipe or tubing that's really smooth inside . . . free from any undercut or projecting weld bead.

Check these Benefits

As before, this new-type TRENTWELD is made from uniformly rolled stainless strip. That's why you'll always get extremely high uniformity both of wall thickness and curvature. And Trent's new *Contour-Welding* brings that same uniformity to the weld zone itself. This means a stronger pipe or tube with smoother flanged or flared ends . . . no cavitation corrosion or erosion . . . better performance in every category than with any other, welded or not.

Try new Trent *Contour-Welded* pipe or tubing for yourself. It's a natural for pressure lines . . . lines carrying corrosive chemicals . . . high-velocity systems. And remember, it's made by Trent — tube-mill specialists.

Why Trent's Exclusive *Contour-Weld* Process Means Smoother Welds . . .

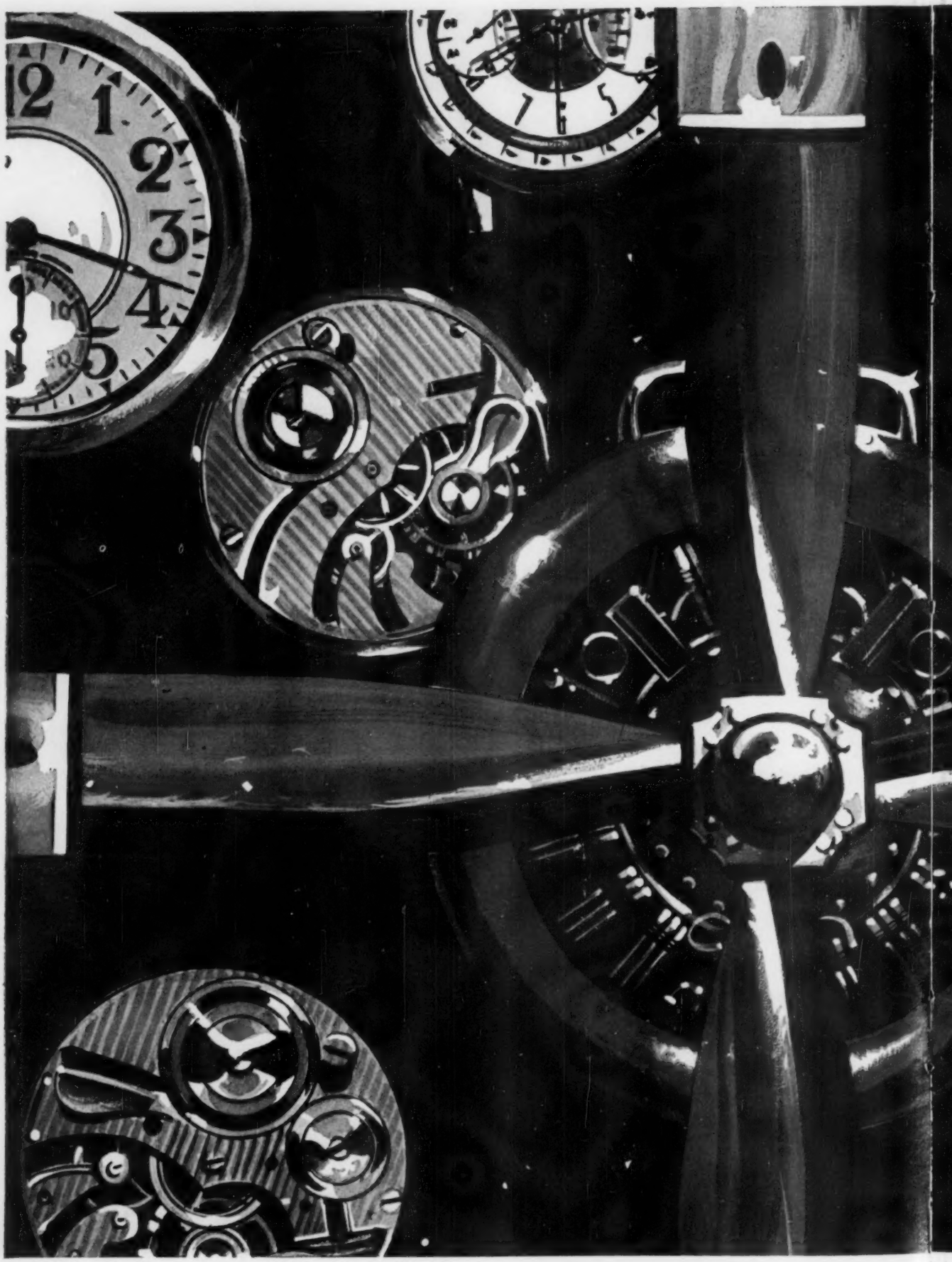
With conventional welding, gravity means beads . . . or undercut, particularly in heavy sections. Gravity pulls some of the molten metal down into the pipe to form a bead that is extremely difficult to remove by cold working. And cold working of the inside bead can lead to undercuts, focal points for erosive and corrosive attack. Cleaning becomes difficult.

With new Contour-Welding, *gravity means smoothness.* Trent's new *Contour-Welding* puts gravity to work. The pipe is inverted, and welded at the bottom. Gravity still pulls the molten metal down — but that simply makes the weld-bead contour correspond to the contour of the pipe itself. That's why there's no tell-tale bulge of weld metal on the critical inside surface. And even on the outside, the weld bead more closely approaches that of the parent metal than other welded pipe.

Contour-Weld is the trade mark of the Trent Tube Co. for its process of welding pipe and tubing which is protected under U.S. Patent 2,716,692.

TRENTWELD **STAINLESS STEEL TUBING**

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)



How to open a Watchmaker's Eyes . . .

Many people regard a 21-jewel watch as the ultimate in precision. Yet, a modern airplane engine is built to a standard of precision far beyond that of the finest watch. For the engine, with moving parts machined to the Nth degree, must operate at speeds in the thousands of revolutions per minute, at temperatures that would melt many metals. And they must do it hour after hour under full load.

Such engines demand the finest motor oils for lubrication. Sinclair is proud that it supplies 45% of all the motor oil used by major scheduled airlines in the United States. That is proof of the high quality of Sinclair lubricants. You can depend on them.

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WHAT'S NEW

Publications Received

• **Review of Current Research and Directory of Member Institutions**—Edited by Renato Contini—Pub. by Engineering College Research Council of the American Society for Engineering Education. Available from Renato Contini, Secretary, Engineering College Research Council, New York University, University Heights, New York 53, N. Y. $2.00; 352 pp. Guide to the various research programs being conducted in our engineering colleges.

• **The Wonder Book of Aircraft**—Pub. by Ward, Lock & Co., Ltd., London and Melbourne—Distributed in the U.S. by John de Graff, Inc., 64 West 23rd St., New York 10, N. Y. $3.00; 224 pp. Book for young people covers history and development of civilian aircraft. Contains eight plates in color and many illustrations.

• **Flying the Omnirange**—by Charles A. Zweng—Pub. by Pan-American Navigation Service, 1202 Ventura Blvd., North Hollywood, Calif. $4.00; 153 pp. Third revised edition of guide to omnirange flying.

• **Atomic Energy—A Realistic Appraisal**—Pub. by the Atomic Industrial Forum, Inc., 260 Madison Ave., New York 16, N. Y. $5.00 per copy, paper-bound. Proceedings of a meeting devoted to an evaluation and interpretation of the Forum's "Growth Survey of the Atomic Industry—1955-1965."

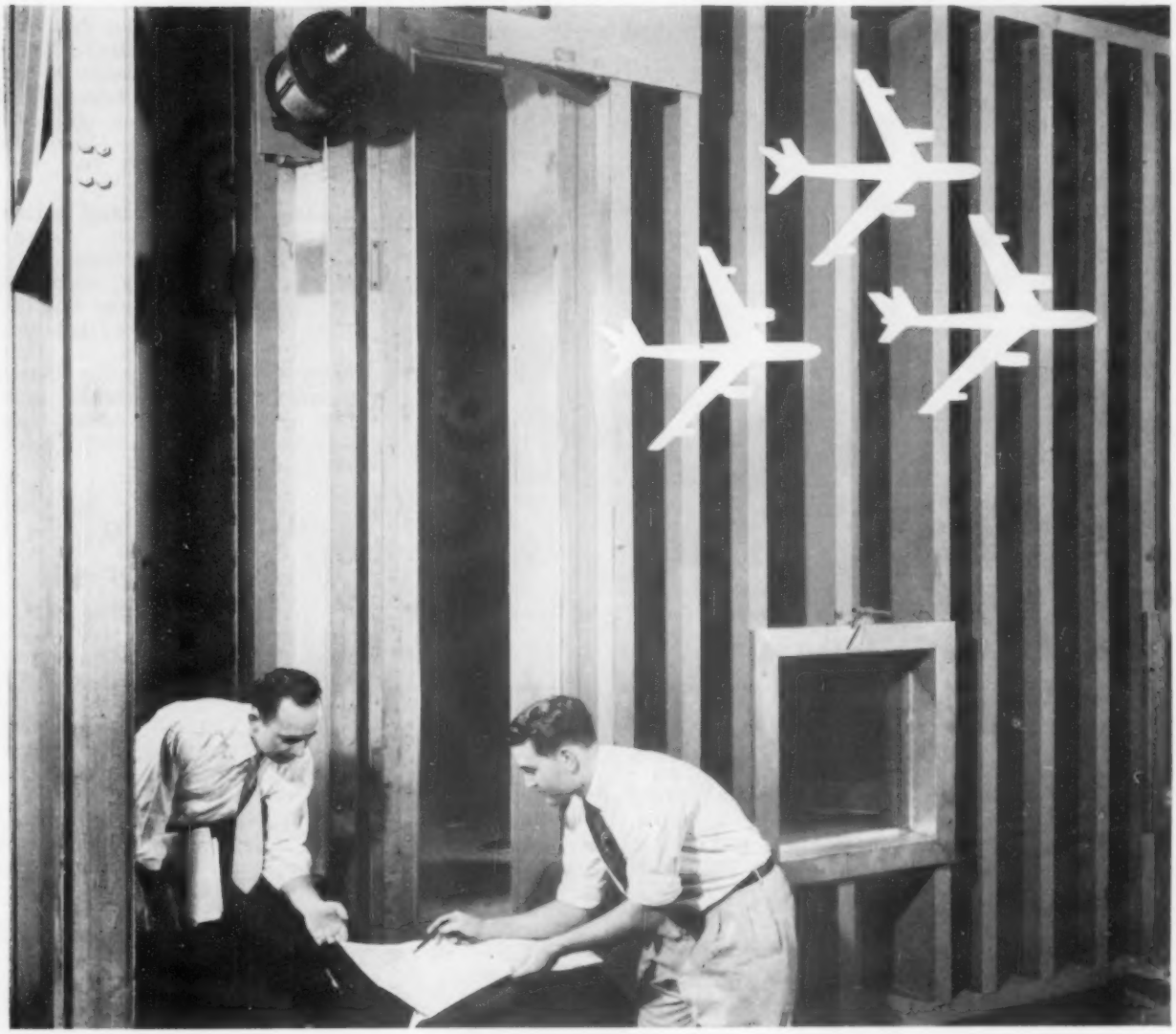
• **Dictionary of Mechanical Engineering Terms**—Originally compiled by J. G. Horner, Seventh edition revised and enlarged by Staton Abbey—Pub. by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. $6.50; 417 pp. Guide to terms used in the theory and practice of mechanical engineering.

• **The Third Service**—by Air Chief Marshal, Sir Philip Joubert—Pub. by Thames & Hudson Ltd., 224 High Holborn, London W.C.1. 21/-net, $2.95; 174 pp. Background and history of the Royal Air Force.

Telling the Market

The Fabricator's Handbook, how to **fabricate rezistal stainless steels,** Crucible Steel Company of America, Oliver Bldg., Pittsburgh 30, Pa. . . . **Bakelite Extruderitems,** new periodical, Issue No. 1, Dept. 46, Bakelite Co., 300 Madison Ave., New York 17, N. Y.

Micabond, bonded mica insulation, Catalog M-55, Continental-Diamond Fibre, Newark, Dela. . . . Electric fur-



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The massive door you see pictured above opens to reveal one of the few stratosphere test facilities of its kind.

This is AC's new stratosphere vibration chamber in which AC products can be vibrated and tested under conditions of controlled temperature and humidity—and simulated altitudes up to 100,000 feet.

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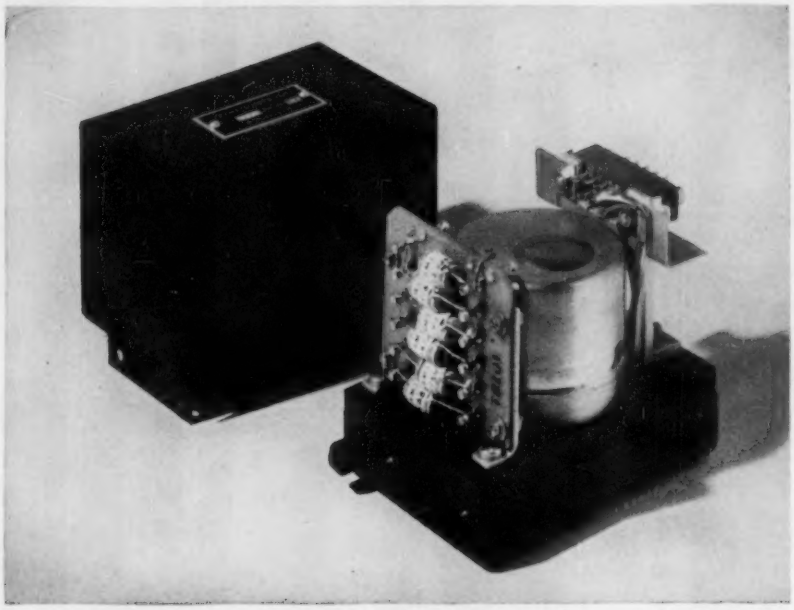

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ALTITUDE POTENTIOMETER

THE TRANS-SONICS® Type 1067 Pressure Operated Potentiometer provides a linear voltage ratio versus altitude output. Input impedance is 10,000 ohms. Maximum voltages up to 100 volts can be obtained so this Altitude Potentiometer can be used without amplifiers in applications such as:

a) Varying servo loop gain as a function of altitude.
b) Modulating the subcarrier oscillator of telemetering systems.
c) Recording and indicating altitude remotely.

Accuracy and interchangeability including effects of nonlinearity, hysteresis, stiction, and friction are within a band ±0.01 VR of the nominal line. Voltage Ratio is 0.55 at −400 ft. and varies linearly with altitude to 1.0 at 50,000 ft. This *linear-with-altitude* relationship is obtained from the linear-with-pressure mechanism by shaping the electrical output with additional resistors across tapped sections of the potentiometer winding.

The Type 1067 Pressure Transmitter is an example of an instrument which TRANS-SONICS, INC. designed for a specific application and produces in quantity and on schedule. Similar instruments, but having a *linear-with-pressure* voltage ratio output, are offered for applications such as telemetering, recording, and experimental development. These units have potentiometer coils with multiple taps connected through a convenient, accessible terminal board to a connector.

Write for Multi-Tap Potentiometer Bulletin
"For Transducers See Trans-Sonics"

Trans-Sonics, Inc.

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naces and ovens, Catalog No. A-7, Cooley Electric Manufacturing Corp., Shelby & Daly Sts., Indianapolis, Ind. . . . **Titanium Progress Report No. 2** gives property and fabrication data, booklet, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

Custom extruding, molding and finishing techniques, bulletin, Geauga, Industries, Middlefield, Ohio. . . . **Products and services** in combustion and heat transfer, Bulletin No. 108, Thermal Research & Engineering Corp,. Conshohocken, Pa. . . . Unit-construction principle of the **Detroit Screwmatic 750 single-spindle automatic screw machine,'** folder, Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich.

Insulated Audio Cord Connectors

Audio-type cord connectors built for aircraft test equipment, quality microphones, instruments and low level sound application, are shock-proofed to provide quick connection through the use of insulating material of Polychloroprene, a resilient synthetic rubber which protects the contacts from dust and moisture.

Panel style rectangular flange receptacle provides closer mounting for crowded installations. Connectors are designated Model XLR.

Manufacturer is Cannon Electric Co., 3209 Humboldt St., Los Angeles 31, Calif.

TWA Base Getting Automatic Recorders

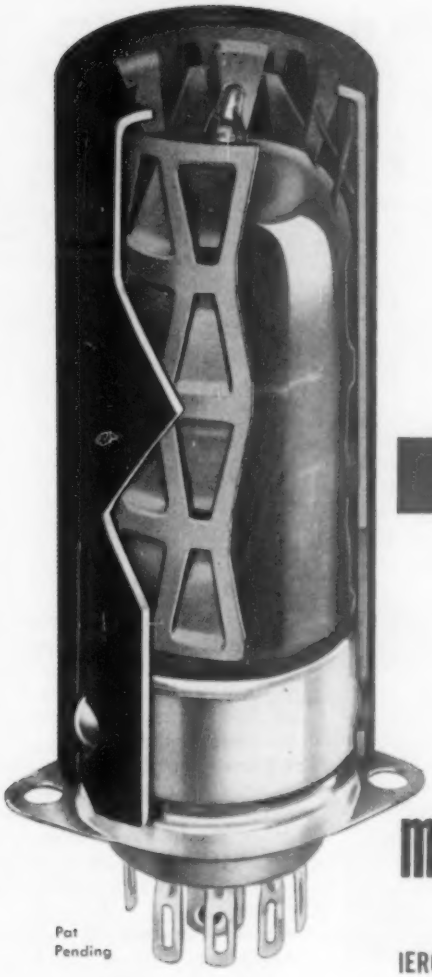
Automatic recorders will be used to maintain permanent performance data records on all engines going through Trans World Airlines' new propellerless engine test stands (AW May 23, p. 68). The stands are being readied for operation early in 1956 at the airline's Kansas City overhaul facility.

Fifty-five recorders will be installed—11 to each of five test cells. They will record pressures, temperatures, fuel flow and rpm. during run-up of newly overhauled engines.

Most of the records maintained by the units will be continuous throughout the entire test period. At present, such data is noted only every five or 10 minutes or so, depending on the type of entry.

The recorders are being supplied by Brown Instruments Div. of Minneapolis-Honeywell Regulator Co., Philadelphia.

TWA says this is the first extensive use of automatic recording equipment in an airline engine test facility.



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electron tube shields make JAN shields obsolete!

IERC's *Temperature Rated shields provide complete electrostatic shielding and effective cooling of electron tubes to within the manufacturer's recommended operational temperature ratings for longest tube life and dependability. TR heat-dissipating shields are available for direct replacement of JAN shields and fit standard JAN sockets.

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CHANGE FOR THE BETTER—from JAN types to TRs is a simple step! TRs fit standard JAN 7 and 9 pin miniature sockets like the TS102P01, TS103P01, etc. Patented liner provides practical vibration control and more shield-to-tube contact for efficient heat dissipation.

For complete information write for "TR" technical bulletin.

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There is an IERC heat-dissipating tube shield for every type of miniature, subminiature, octal and power tube.

Use of Hydraulic Systems Gains With Further Redesigns Planned

By George L. Christian

Detroit—Use of hydraulics to power jet aircraft accessories continues to expand, the 1955 Transport Aircraft Hydraulics Conference was told, with a wide program of redesign and product improvement by equipment and aircraft manufacturers backing up the move. Among the trends reported at the Vickers, Inc.-sponsored meeting were:

• **Combining two or more pieces** of hydraulic hardware in a single component. One example is the Lockheed/Vickers pump control valve used on the Super Constellation. In this valve, five separate units are combined in one, eliminating nine connections and thereby reducing leakage and cutting weight and size. The airlines urged that this practice be expanded.

• **Centralizing aircraft systems,** including hydraulic, in special bays. This is being done in Lockheed's turboprop Electra, which will have a simple but complete hydraulic system.

• **Extension of hydraulic applications.** Vickers is meeting the challenge of air turbine drives for large aircraft with development of hydraulic starters for jet engines and higher-powered hydraulic transmissions for large-capacity cabin superchargers. Edward I. Brown, chief engineer, aircraft products, at Vickers' El Segundo division, said that pneumatics has held a near-monopoly on jet engine starting, but that this has been due mainly to the lack of suitable hydraulic equipment. Now Vickers is furnishing off-the-shelf MF-3921-30 hydraulic motors for use as starters on Pratt & Whitney's J57 engines.

The power pack needed to supply hydraulic energy to the starter is a relatively simple, inexpensive and lightweight affair, Brown says. Total weight of the pack—150 lb.—includes a McCulloch gasoline engine, a Vickers Model 3918 variable displacement pump, governor, cooling fan, pressurized reservoir and a selector valve.

• **Systems approach.** Vickers engineers are aiming at improvement of hydraulic performance through analysis of complete aircraft hydraulic systems, rather than refinement of individual components as in the past.

• **Titanium tubing.** L. Calzi, of Superior Tube Co., Norristown, Pa., announced that his company has begun manufacture of this tubing and is supplying experimental quantities to aircraft manufacturers. Calzi said that Superior's vacuum annealing process increases the metal's fatigue life, but the tubing cannot be flared and little is known about its bending characteristics at present.

Switch to Hydraulics

Although military aircraft up to two years ago were making increasing use of air turbines (pneumatics) to drive constant-speed alternators, now practically all have switched to hydraulic drives, Brown told the meeting. The reasons:

• **Thrust penalty** for extracting bleed air is two to three times that of doing the job through shaft horsepower, which drives the hydraulic units.

• **Fuel penalty** is twice as great when bleed air is used instead of shaft horsepower.

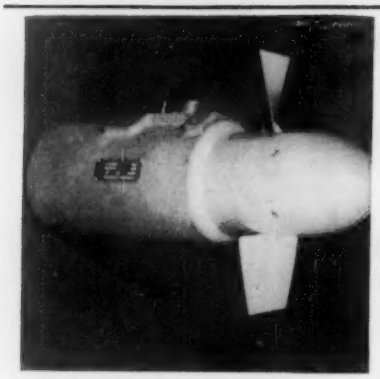
• **Drive efficiency** of a throttled inlet air turbine drive is about half that of a hydraulic transmission.

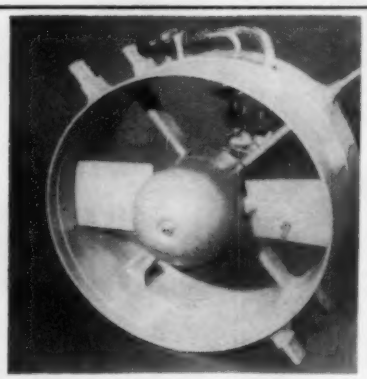
• **Size and weight penalty.** Air turbine drives are made bigger than they need to be because size is dictated by relatively low volume of bleed air available during letdown, rather than the larger volume available during cruise conditions.

• **Better than electricity.** Brown says a hydraulically driven a.c. power package (consisting of a hydraulic motor, a direct-driven 8,000-rpm. alternator and a speed control), delivering current for the co-pilot's instruments or emergency power for fighter planes, weighs 11 lb., has overall efficiency of 61% and a guaranteed frequency regulation of plus or minus 1 to 1¼% over a 25% load range. The equivalent inverter weighs 38 lb. and has an overall efficiency of only 40%, Brown says.

Leakage Control

P. A. Hartline, project engineer-hydraulics at Trans World Airlines, called for more agressive design improvement by the equipment industry to end the hydraulic fluid leakage problem. He pointed out that one obvious course is



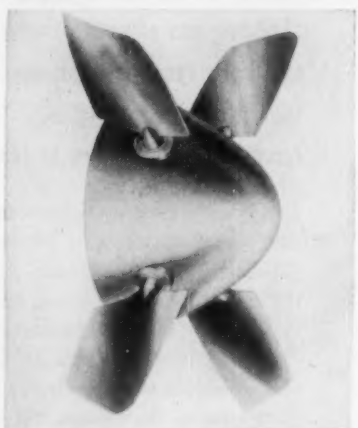


New Emergency Power Supplies

Three new emergency, ram-air-driven power supplies have been developed by Aeroproducts Operations, Allison Div. of General Motors. Units are popped out into the airstream to supply an aircraft's system with emergency power in case of normal system failure. All three are driven by variable-pitch propellers. Simple fly-weight-type governors maintain constant rpm. by mechanically changing prop blade pitch.

• Above left is an air-driven generator used to supply emergency electrical power to Navy's Douglas A4D Skyhawk. Output of the generator is sufficient to operate controls (through an electrically driven hydraulic pump) for flying and landing the plane and to operate all electrical equipment essential to maintaining flight. It is also adaptable to high-speed tow targets and drones.

• Top right is an emergency ram-air-driven hydraulic pump now being installed on the F-100 Super Sabre. It will develop full pressure in less than two seconds after being extended into the airstream. The constant displacement pump supplies sufficient hydraulic pressure to operate the plane's flight controls and allow it to be landed.



• Above is a 22-in.-dia. four-bladed emergency power unit capable of developing 44 hp. It was specifically designed to be used on high-performance jet aircraft and may be adapted to drive either an electric generator or hydraulic pump.

Turning on the Heat

Exhaust heat from 50-hp. Mars gas turbine is shown being used to melt ice from the deck of a Navy ship in the Arctic. Solar Aircraft Co. says this is one of several new applications of its versatile gas turbine. Another is for generating fog by vaporizing fog oil. Solar says the Mars makes about four times as much fog as conventional apparatus of the same weight.

to reduce the number of connections and fittings by combining hydraulic components into single units. Components which could be combined, he says: unloading, relief and check valves; and dual boost cylinder, dual control valve and by-pass valve.

Lockheed's representative pointed out that his company is developing packaged hydraulic systems, which will greatly reduce plumbing and the number of hydraulic lines. He said that this would result in greater reliability and accessibility, as well as reduced leakage.

Spokesmen from Boeing and Convair agreed that the best maximum pressure for today's military aircraft is 4,000 psi., although Boeing is testing advanced systems at 5,000 psi. Thus far, Boeing's tests indicate that only minor weight advantages are to be gained at 5,000 psi.

Anti-Skid Devices

Comments on anti-skid braking devices were generally favorable. For example:

• **Hydro-Aire's Hytrol** is reliable and reduces tire wear, according to Northwest Orient Airlines.

• **Westinghouse's Decelostat,** after 1,200 hr. of test use on a Convair 340, has reduced tire wear considerably, says Delta.

• **Dunlop's Maxaret** unit is giving good service on the Viscount, says Capital Airlines. Units require little maintenance and reduce tire wear. In 3,000 landings, there has been no evidence of a single skid.

• **Goodyear's electro-mechanical** system is working out very well on the Swedish J-29 and J-35 fighters, according to Vickers. Its cycling rate is said to be faster than that of the Maxaret mechanical system, resulting in better braking on the frozen lakes the Swedes use as landing fields in the winter.

Conference Sidelights

Conference discussions also brought out the following:

• **Hydraulic overhaul shop noise** can be lowered by reducing speed of pumps being tested to 1,800 rpm.

• **Pump drive shaft seal wear** can be reduced by reducing drive shaft diameter, Air France says. This is because the resultant reduction in shaft linear speed means less friction and heat.

• **Color coding of O-rings** may be eliminated—leaks in high-temperature applications have been traced to the color dot.

• **New O-ring hose liner compound,** called Vyram, has been developed by Monsanto, which says Vyram seals should be available within a year.

ENGINEERS NEEDED ON NEW GRUMMAN

...NAVY *Fighters*

Grumman, one of the most stable aircraft companies in the industry, needs engineers to work on the new supersonic Tiger and transonic Cougar. With Grumman, your home will be Long Island, the playground of New York. If you are an experienced aircraft engineer, or a recent engineering graduate, send your resume to Engineering Personnel Dept. Interviews at Employment Office.

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Stress Analysts
Flight Test Engineers
Aerodynamicists
Thermodynamicists
Vibration and Flutter

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GRUMMAN AIRCRAFT ENGINEERING CORPORATION
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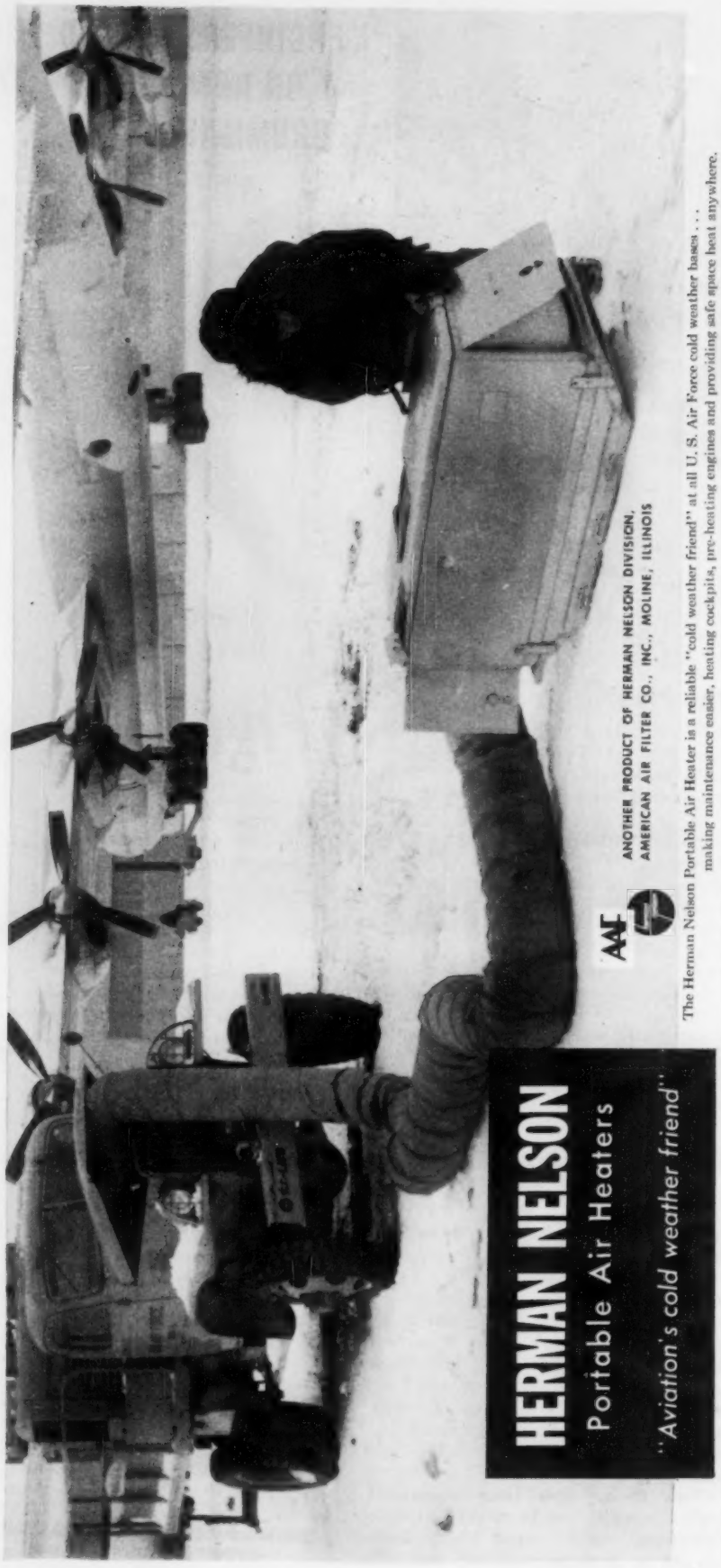
HERMAN NELSON
Portable Air Heaters
"Aviation's cold weather friend"
AAF
ANOTHER PRODUCT OF HERMAN NELSON DIVISION,
AMERICAN AIR FILTER CO., INC., MOLINE, ILLINOIS
The Herman Nelson Portable Air Heater is a reliable "cold weather friend" at all U. S. Air Force cold weather bases . . .
making maintenance easier, heating cockpits, pre-heating engines and providing safe space heat anywhere.

Portable Rig Speeds Winter Servicing

Trans-World Airlines speeds up winter servicing of planes with a cart carrying a drum of fluid, Fast-Flow drum pump and a cylinder of compressed nitrogen.

The rig picture here is used to spray propylene glycol as a de-icer on wing surfaces. It can also be used for filling anti-detonating injection fluid tanks and filling special fuselage storage tanks with alcohol for de-icing windows, carburetors and propellers.

The pump, manufactured by the Gray Co., Inc., Minneapolis 13, Minn., is made portable by using a cylinder of compressed nitrogen instead of customary air compressor. The wheeled cart was designed and built by TWA.

PRODUCTION BRIEFING

▶ **Barry Controls, Inc.** is building a $250,000, two-story addition to its plant in Watertown, Mass. New structure will contain 24,000 sq. ft. of floor space. Company will spend an additional $50,000 renovating its present quarters.

▶ **Ryan Aeronautical Co.,** San Diego, Calif., reports its highest payroll since the end of World War II with 4,600 employes.

▶ **Edo Corp.,** College Point, N. Y., builder of airplane floats and electronics devices, celebrated its 30th anniversary Sept. 29.

▶ **Kollsman Instrument Corp.** has begun construction on a one-story 157,000-sq. ft. manufacturing plant in Syosset, L. I., N. Y. The new facility will increase Kollsman's combined working area to about 500,000 sq. ft. The structure will house the machine shop, as-

BARBER COLMAN

Aircraft Controls

compact, powerful high quality d-c motors for a wide range of applications

When you specify Barber-Colman sub-fractional hp motors, you can be sure you are getting the finest of quality and dependability. Each of these motors is backed by more than 50 years of Barber-Colman Company's experience in expert designing and engineering, precision production, intensive testing. Each carries the extra quality control feature of "one responsibility," because Barber-Colman Company, as a manufacturer itself of machine and small tools, produces its own gears, plastic parts and other components. Available in both permanent magnet and split-series types . . . in various mountings and speeds, and outputs up to 1/10 hp . . . Barber-Colman d-c motors are ideally suited to power electro-mechanical actuators, gear heads, fans and blowers, and programing devices.

OTHER BARBER-COLMAN AIRCRAFT PRODUCTS

Temperature Controls
Cycling, full proportional, Micropulse, electronic . . . for military, commercial, and executive aircraft.

Valves
Wide variety of electrically and pneumatically actuated air valves for temperature and pressure control applications.

Actuators
Rotary and linear types combining gear reductions, switching, mountings, and other features to meet most applications in their load-speed class.

Positioning Controls
Integrated electric or electronic systems designed to your specifications. Anti-hunt feature provided by unique circuitry.

Thermo-Sensitive Elements
A complete line of wire and thermistor sensing elements is manufactured for use in resistance bridge type control circuits.

Ultra-Sensitive Relays
Polarized relays in sensitivities from 50 microwatts to 1 milliwatt. Wide range of coils, enclosures, mounting details.

Barber-Colman small d-c motors are available with lightweight radio noise filters to meet radio interference suppression requirements of USAF. These motors are well adapted for use as tachometer generators. Whatever your problem involving small motors, consult with Barber-Colman engineers for an expert solution. For advance technical data, write for free catalog F 4344-1.

Barber-Colman Company

Dept. X, 1422 Rock Street, Rockford, Illinois

Aircraft Controls • Automatic Controls • Industrial Instruments • Small Motors • Air Distribution Products • Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

Diana Deutch, Miss New York, 1955

THIS BABY MUST WATCH HER WEIGHT

Beauty is important in everything but it takes more than eye-appeal to maintain leadership in the aircraft industry. Among the jet builders, weight is a vital factor in determining flight performance at supersonic speeds and mile-measured altitudes.

CENTURY'S COMPARTMENT PNEUMATIC TEMPERATURE CONTROL takes the lead in both weight and serviceability . . . tips the scales at less than a pound and a half yet is more efficient than other similar equipment many times its size. Using only jet engine bleed air this versatile all pneumatic system, with a small remote thermostatic unit, controls point heating and cooling for various compartments . . . heats landing gear oleos . . . cools electronic equipment. Adaptable in any shape or form for specific operations, it is a proved provider of accurate temperature control, designed by men who have made Pneumatics their business.

The solutions to many problems of control in jet aircraft are possible through Pneumatics . . . the dependable stock-in-trade of Century Controls Corp.

Send for literature on this and other Century Products.

Control problems welcomed . . . solutions, based upon Pneumatics, promptly submitted.

Century Controls CORPORATION

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RECORD THE DATA YOU WANT with the RELIABLE V-10

The high cost of setting up for tests makes imperative the extreme reliability which *only* the V-10 Camera has proven *in the field*... in more in-use tests than any other recording camera...in the fastest aircraft...at highest altitudes... subjected to rigorous in-use tests of vibration and G-load and temperature change under actual working conditions.

BUILT BY ENGINEERS—FOR ENGINEERS

The V-10 Camera is specially designed and built for all applications where essential data can be recorded photographically. It is not just another "movie" camera with modifications. The V-10, therefore, has features not found in other units. For example: (1) Fewer working parts . . . (2) Faster, simpler loading and unloading . . . (3) Compact, requires only 1/5 cu. ft. space . . . Room for Intervelometer ***inside*** case . . . (4) Film travel either up or down . . . (5) Double frame picture size optional . . . (6) Can be converted into a projector easily and quickly... (7) Remote film indicator switch.

FOR COMPLETE REPORT COVERING THESE AND MANY OTHER V-10 FEATURES, WRITE, WIRE OR PHONE

PACIFIC LABORATORIES

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sembly areas, shipping, receiving and other departments.

► **North American Aviation, Inc.**, has awarded a $475,000 contract to Diversified Builders, Inc., of Los Angeles for construction of a one-story office building for its Propulsion Development Center in Canoga Park, Calif. The new building will be adjacent to the $3-million Propulsion Development Center which is nearing completion.

► **Commercial Research Laboratories, Inc.**, manufacturers of Cox flowmeters and scientific instruments, became a division of the George L. Nankervis Co., and will continue to operate under the direction of Claude E. Cox, CRL founder and president since 1912.

► **Kenco Manufacturing Co.** is doubling its Los Angeles plant area at 5211 Telegraph Road. Expansion includes increased production facilities and the development of automatic and semi-automatic mass production processes to be applied to small punch presses.

► **Rodney Metals, Inc.**, New Bedford, Mass., has opened a new office and warehouse at 4312 Pacific Way, Los Angeles 23, Calif., under the supervision of William Brown. The new company will be known as Rodney Metals of California, Inc.

► **Pastushin Aviation Corp.** has received a contract in excess of $200,000 from North American Aviation for an undisclosed quantity of engine accessory covers to be used on North American's F-100D Super Sabre.

► **Research & Control Instruments Div.** of North American Philips Co., Inc., has opened a new West Coast office at 1485 Bayshore Blvd., San Francisco, Calif.

► **Aircraft tires** meeting new USAF requirements for service in extremely high temperatures at high speeds under heavy loads are now being manufactured by B. F. Goodrich Co. The tires were satisfactorily tested in temperatures as high as 280F under peak loads of 19,000 lb. at landing speeds up to 170 mph.

► **Wallace Aviation Corp.**, Wallingford, Conn., recently acquired by Clevite Corp., is being renamed Clevite Aero Products, Inc.

► **American Research Corp.**, Bristol, Conn., has installed two pieces of equipment for the testing of jet engine components and controls at the Hamilton Standard Div. of United Aircraft Corp., Windsor Locks, Conn. One is a liquid chilling unit capable of lowering or rais-

RECORD SIX YEAR PRODUCTION PAVES WAY FOR NEW GIANTS

Largest airframe assembly subcontracted. Ryan is producing huge aft fuselage sections for the Boeing KC-135 jet tanker-transport. This new project follows six years of continuous on-time production of fuselage sections for Boeing's KC-97.

It's a tail of two cities. The huge structures built by Ryan in San Diego must mate perfectly with sections produced at Boeing's Seattle-Renton plants. This demands precision manufacturing, perfect planning and flawless coordination.

Techniques, planning and skill save money. Ryan reduced costs 40% during production of KC-97 assemblies. This saving was passed on to Boeing and the Air Force – to provide more aircraft per defense dollar. This is just one example of the outstanding cost-performance at Ryan. The same manufacturing efficiency and smooth integration is found in the production of fuselage sections for Sabre Jet fighters and other military and commercial airframe components such as fuel tanks, control surfaces, wing sections.

Established, financially stable. Ryan performs subcontracts without progress payments from customers. A veteran of 33 years exclusively in the aircraft business, Ryan understands the industry's problems as only an aircraft company can. It has the modern facilities, most advanced manufacturing techniques, and highly skilled engineering and technical personnel needed to produce the industry's most difficult production assignments.

For 33 years, Ryan has excelled in designing and producing high quality aircraft, power plants and avionics – built at low cost, delivered on time.

RYAN

AERONAUTICAL COMPANY

SAN DIEGO 12, CALIFORNIA

NOW...
27
CHANNELS
narco
simplexer
VHF RECEIVER
and TRANSMITTER

All the frequencies you want for any tower or center communications can be accommodated in the new 27 channel Narco Simplexer. This top-quality communications unit embodies a wide-band transmitter—actually six separate transmitting circuits — for uniformly strong transmission plus the famed Narco "whistle-stop" tuning feature which lets you tune the VHF receiver precisely to the frequency desired.

The Simplexer accommodates all 24 frequencies used between 118.1 mc and 122.8 *plus* 126.7 mc, *plus* two additional crystals for special purposes.

No other communications unit available has the quality, the proven stamina and reliability plus compactness for anywhere near the price. Your communications problems will be solved with the new VC-27 Simplexer. See it at your Narco dealer's or write for new brochure.

Omniplexer Adds OMNI for only $195

Here's the answer for a low-cost, accurate Omni—the Narco Omniplexer which can be plugged into any Narco Simplexer. Only 3" high and 6¼" wide, it has vernier tuning for precise course setting. Ideal as a basic navigation system or the low-cost answer for dual omni.

narco
NATIONAL AERONAUTICAL CORP.
Ambler, Pennsylvania

ing the temperature of jet fuel to simulate actual operating temperatures. The other is an air chiller which lowers the temperature of air supplied to various types of air cycle refrigeration systems and components to simulate actual operating conditions.

► **Carmody Corp.** has moved from Buffalo Municipal Airport to 3119 Genessee St., Buffalo, N. Y., tripling the company's working space. Carmody designs and manufactures training devices for the military and industry.

► **Cal-Connector Corp.** will be the new name for the merged Cal-Connector Co., Electro-Fit Co. and Glenn Air Co. Scott L. Glenn is president and R. Tigerman vice-president.

► **Canadair Ltd.**, Montreal, has established an on-the-job training program in its engineering division where 40 graduate engineers will be oriented in the design and production of aircraft, guided missiles and nuclear installations. The program will include temporary assignment to Pomona, Calif., in the Convair Div. of General Dynamics Corp., the parent company.

► **Sikorsky Aircraft and Lycoming Div.** of Avco Manufacturing Corp. have jointly announced a contract in excess of $1 million, calling for the production of main gear box kits for military helicopters. Lycoming will produce the gear boxes for the recently introduced Sikorsky S-56 twin-engine helicopter.

► **Northrop Aircraft, Inc.**, is expanding its flight test installation at Palmdale, Calif. The new construction, totaling nearly 3,500 sq. ft. and scheduled for completion in March 1956, will include a new personnel and plant protection office building, a new fire equipment storage station and additions to existing paint and strip building.

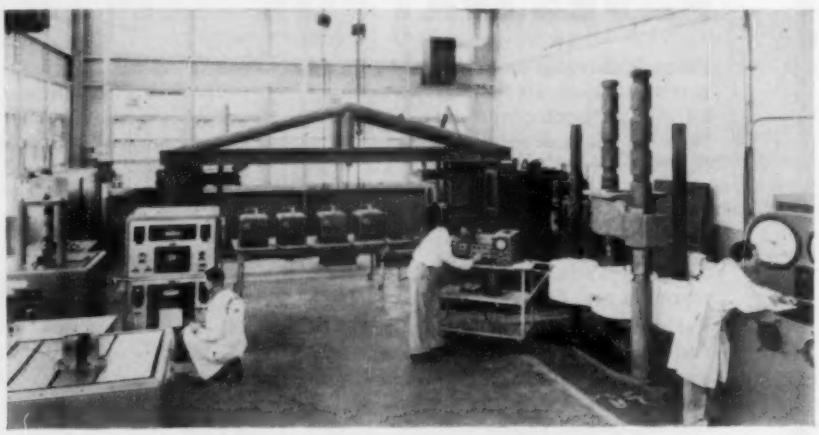
► **AiResearch Manufacturing Div.** of Garrett Corp. is manufacturing a motor-driven cooling fan of revolutionary design for Motorola, Inc., Chicago. The fan can operate at high temperatures for long periods of time. Three of the fans, along with a heat exchanger, cool Motorola's new pressurized radar indicators for radar sets.

► **Nuclear Science & Engineering** Corp., Pittsburgh, Pa., subsidiary of Norden-Ketay Corp., is producing radio-isotopes in cyclotrons for industrial users. Atomic Energy Commission, the only previous U. S. supplier of cyclotron-produced radio-isotopes has discontinued this program, the firm states.

► **Browne & Shaw Co., Inc.**, Waltham, Mass., recently formed by Secor D. Browne and John D. Shaw, will manufacture precision aircraft pumps and specialized aircraft parts.

► **Harvey Aluminum**, Torrance, Calif., is now fabricating titanium alloy extrusions in 10-ft. to 12-ft. lengths on a production basis. Entire volume is being shipped to airframe manufacturers.

► **Neoflow camera** precision photocopying equipment makes sharp, clear, reduced-size copies of any type of drawn, written, or printed original on a con-



Fatigue Testing at Northrop

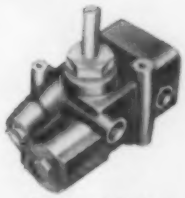
Fatigue testing machines in this Northrop Aircraft, Inc., laboratory at Hawthorne, Calif., range in load capacity from 50 lb. to 250 tons. The four smallest machines establish endurance and suitability curves for materials for fittings and castings. The larger machines are used to test aircraft components. A 600,000-lb.-capacity universal testing machine applies compression loads to calibrate a specially designed resistance wire strain gage transducer for use in measuring loads applied by a 500,000-lb. fatigue machine. Fatigue testing machines were built by Baldwin-Lima-Hamilton Corp. of Philadelphia.

A FEW OF THE new

VICKERS®

AIRBORNE HYDRAULIC VALVES

Hydraulic Motor with Anti-Overrun Flow Control



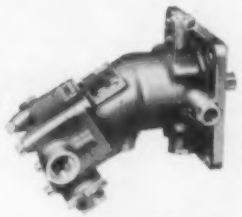
Constant Gain Nose Wheel Steering Valve

from New "Concept-through-Production" Facility at El Segundo Division

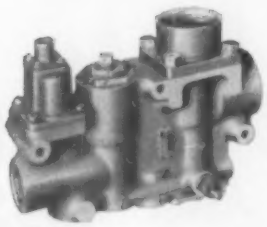
The valves shown are representative of an expanding line being built to meet rapidly advancing airborne requirements. They were developed in close cooperation with the airframe and power plant engineers who are using them. They are products of Vickers El Segundo (California) Division, which has complete engineering, laboratory and production facilities for "concept-through-production" of airborne hydraulic valves.

Thoroughly experienced in the requirements of aircraft systems and working closely with the Detroit organization, the El Segundo staff can quickly solve new problems in design. As soon as the prototype is approved, it becomes a production item in minimum time. Ask the nearest Vickers Application Engineer for further information or write for Bulletin A-5209.

Flow-Sensitive Pressure Regulator



Motor with Constant Speed Valve



Pump Control Valve

Relief Valve with Thermal Protection

Power Control Flow Regulator

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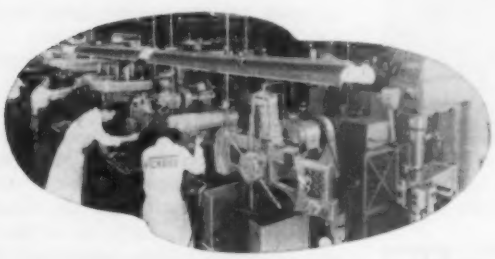
Design, Development, Testing and Manufacturing at El Segundo Division of Vickers Incorporated.



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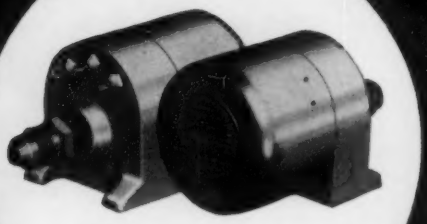

New Model 45154S
pressure transmitter

BUILT TO PERFORM DURING VIBRATION OF

25g
to 2000 cps

that's a lot of vibration
but it's no problem for this ruggedized version of the smallest and lightest of the Giannini Pressure Transmitters.

SMALL SIZE — LIGHT WEIGHT
Measuring 2.4 in. in length x 1.75 in. diameter — and weighing less than 6 ounces, this unit is ideal for pressure surveys or for use in applications where space and weight are vital factors.

SPECIFICATIONS
PRESSURE RANGES — 0-5 to 0-20 psi abs., diff. or gage.
POTENTIOMETER RESISTANCE 2000 Ω to 7500 Ω total.
RESOLUTION — 230 wires (0.45%)
REPEATABILITY — ±0.5%
LINEARITY — ±1.0%

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G. M. GIANNINI & CO., INC., PASADENA 1, CALIFORNIA

tinuous flow basis. It is made by Peerless Photo Products, Inc. Convair-Fort Worth reports an average savings of $3,000 monthly through the use of this camera and forecasts a saving of $10,000 monthly during the next 12 months.

▶ **Crosley To Build For B-52**—Crosley, division of Avco Manufacturing Co., is being set up as a second source on the Arma-developed A-3 radar-directed tail turret system for the B-52.

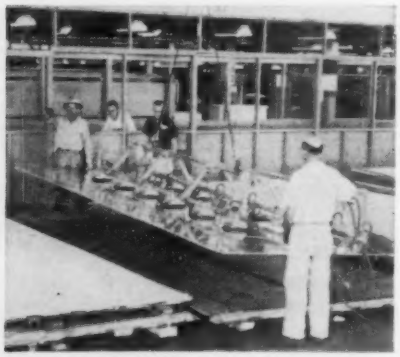
▶ **Wright Aeronautical Division** has established a separate Spare Parts Department as well as new Spare Parts Depot at Hackensack, N. J.

▶ **Harrison Engineering Services** has been appointed exclusive representative for Wallace Supplies Mfg. Co. tube bending machines and abrasive cut-off units for East Coast aircraft manufacturers.

▶ **Tube Reducing Corp.**, Wallington, N. J., has converted 100,000 sq. ft. of floor space in their No. 2 plant to a production area for a special type of cold finished tubing. The "Rock-drawn" tubing will be produced by a process combining cold compression rolling and cold drawing.

▶ **Standard Steel Corp.**, Los Angeles, has received a contract for more than $250,000 from Aerojet-General Corp. for the manufacture of 24 stainless steel pressure vessels. The high-pressure vessels are designed for low temperature liquid propellants used to operate rocket motors.

▶ **Aircraft Engineering & Maintenance Co.**, Oakland, Calif., has been awarded



LIFTING DEVICE handles sheets weighing 800 lb. and measuring 96x250x$\frac{5}{16}$ in. by utilizing 12 suction cups suspended from a framework of steel. Air is forced in and out of the cups through a central control panel; each cup is independent in its air supply as a safety factor in the event one should fail. Developed by Convair Div. of General Dynamics Corp., the device is designed to handle loads up to five tons, each cup having a lifting potential of 400 lb.

a $3-million jet aircraft overhaul contract by Air Material Command.

► **Industrial Tectonics, Inc.** has purchased the manufacturing facilities of Anti-Friction Bearings Co., located at 5010 E. Washington Blvd., Los Angeles. The new plant will handle sales of ball bearings for the western states.

► **J. B. Ford Div.** of Wyandotte Chemicals Corp. has recently opened enlarged technical service laboratories in Wyandotte, Mich., and Los Nietos, Calif.

► **Marquardt Aircraft Co.'s Research Div.** has moved to expanded quarters adjacent to the production and engineering plants in Van Nuys, Calif. The new research center includes laboratory and experimental manufacturing areas.

► **Detroit Reamer & Tool Co.** has moved to new offices at 780 West Maple Road, P. O. Box 174, Birmingham, Mich.

► **Northrop Aircraft, Inc.,** has completed a Materiel Div. headquarters in El Segundo, Calif. The center will consolidate materiel functions, including purchasing, warehousing, receiving, shipping and receiving inspection.

► **Harvey Machine Co.** and Harvey Aluminum will begin construction of a reduction plant at The Dalles, Ore., early in 1956. The plant will have an annual capacity of 108 million lb. and is scheduled for completion in late 1957.

► **National Aircraft Corp.,** 3411 Tulare Ave., Burbank, Calif., has acquired Metropolitan Airports and the western division of Florida Aviation. Another recent acquisition, Mar Vista Electronics Co., was formerly the electronic division of Hydro-Aire.

► **Niles-Bement-Pond Co.,** recently merged into Penn-Texas Corp., has been transferred to a newly formed corporation to be known as Pratt & Whitney Co., Inc. It is a subsidiary of Penn-Texas with Alexander H. d'Arcambal as president. Chandler-Evans and Potter & Johnston Co. will be operated as a division and direct subsidiary, respectively, of Pratt & Whitney Co., Inc.

► **Goodyear Tire & Rubber Co.** is in the midst of a two-year plant expansion and improvement program involving the capital outlay of $100-million. The program includes new plants in Akron; Houston, Tex.; Jackson, Mich.; Niagara Falls, N. Y.; Litchfield Park, Ariz.; and tire factories in Glasgow, Scotland; Colombia and Venezuela.

ANNOUNCING

a new long life BG spark plug

The new BG platinum electrode spark plug – RB 39R – has now been CAA approved for Pratt & Whitney's R4360, R2800, R2000, R1830 series engines.

Designed in the tradition of quality established by BG, a leader in the field since 1917, the RB 39R features a new anti-fouling ceramic core design, an all weather top, and a new ground electrode design for long life.

As an added service, BG maintains a facility for factory overhaul of all platinum electrode spark plugs. Factory overhaul combines economy with long life and trouble free service.

the name that is first with aircraft engineering and maintenance personnel

For information concerning the RB 39R and other BG products, write to:

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321 BROAD AVENUE · RIDGEFIELD, NEW JERSEY

engineers:
LOST
in the shuffle?

Are you drowning in an Engineering Pool? Are you held back by lack of opportunity?

Then, consider how much better off you'd be in a medium-sized, progressive organization, one large enough to offer a variety of opportunities yet small enough so that individual effort can be recognized. Send your resume.

Stratos needs experienced, qualified engineers to work in the development of new air-conditioning systems, air-turbine drives, controls, and other pneumatic accessories for aircraft and industry. Company supported research and development programs are underway leading to the development of new industrial as well as aeronautical equipment.

Send a detailed resume today to R.T. Bartlett, and be sure to include your home address. All information kept in strictest confidence, naturally.

Excellent housing is available on attractive Long Island. Wonderful recreational facilities – fine beaches, boating, fishing and golfing.

STRATOS
A Division of Fairchild Engine & Airplane Corporation
Bay Shore, L. I., N. Y.

LETTERS

'Surgery' For CAA

As an ex-CAA employee 1941-1953 here is my contribution:

Prescription—Surgery

For the CAA corpus I suggest the following surgery:

1. Give it a head which will be held in high esteem and respect by all.
2. Give it a mind with a reputation for independence and forthrightness.
3. Give it a heart filled with compassion and understanding.
4. Give it arms and hands that will reach out, above the table, in public service to all.
5. Give it sturdy legs and feet attuned to mind, heart and soul, to seek and search out the truth, without fear or favor.
6. Remove wasted or wasting Commerce cells, and other cancerous growths.
7. Place in an atmosphere or climate of moderate independence.

ROLAND M. DOLDER
Attorney at Law
Maple Ave. and Park St.
Vienna, Virginia

On Printed Circuits

The article on "New Handbook to Guide Design of Airlines' Avionics Equipment" which appeared in the October 10th issue of AVIATION WEEK was extremely interesting.

In one sense, however, we must take issue with what you say on Page 63. In the first complete paragraph at the top of the page, you indicate that the state of the art is such that a speedy replacement of individual components cannot be accomplished without destroying a printed circuit board. This is not true if reasonable care is taken. Perhaps this statement would have been entirely in order two or three years ago when the bond strength of copper foil to the base material was somewhat questionable. However, etched circuit boards being currently produced utilize material where the bond strength is sufficiently high to permit repeated soldering and unsoldering with small wattage irons, enabling the rapid replacement of defective components.

ALAN P. KINGSBURY
Photocircuits Corporation
Glen Cove, N. Y.

(S. B. Poritzky, of Aeronautical Radio, Inc., and author of the article says:

"The statement was based on discussions with several printed wiring board manufacturers at the 1955 IRE show. Several of them indicated that components could be removed from these boards once or twice or perhaps three times during the life of the equipment, but they were very reluctant to state that the integrity of the board could be maintained with frequent removal of parts. Because if the very long service life of most airline equipment, it is very likely that particular components will have to be removed and replaced many times during the life of the equipment. If printed wiring boards are now available which can stand the frequent removal and replacement of parts, we are indeed pleased to know about them."—Ed.)

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

'Man of the Year'

Congratulations on your article about North American Test Pilot George Smith. Mr. Smith certainly should be elected Aviation's "Man of the Year."

RICHARD H. HOWE
1 Thomas Place
Leominster, Massachusetts

F3H-1 'Debacle'

It would seem to the writer who worked many years professionally in aviation circles that the Navy F3H-1 debacle would justify a rebuke to those procurement officers of the Navy who were placed in charge of this project.

The excuse that the jet engine selected developed technological difficulties is difficult to accept, and furthermore, the impact of this engine selection in delaying the production of three other naval combat airplanes certainly makes it evident that while deliberate fraud was not perpetrated, it should not be dismissed with impunity.

The airframe manufacturer and the naval authorities should mutually accept this blame for failure to produce, which in a war of survival, could have serious consequences. The fact that the manufacturer did not request cancellation of the project when the Navy added additional weight but did not supply engines of sufficient thrust to achieve the performance desired makes the airframe manufacturer equally a partner to this so-called honest mistake. And this would be obvious in advance to any project engineer or procurement officer worth his salt.

The five factors listed by the engine manufacturer as cause for his failure to supply a jet engine to the specified thrust were certainly known in advance. Thus the airframe was doomed to failure before it started as a production item. But the fact that several planes crashed, several brave test pilots killed, demands that immediate corrective practices should be inaugurated in Navy plane procurement.

This tax payer objects to repetitive mistakes made by Navy procurement officers. There have been too many. Just as a way of reminder to jog the memories of BuAer personnel, we have had others; i.e. the Martin MO-1, the Packard watercooled engines, The Douglas SB2D, the Brewster mess, and now this. Yet the Navy is willing to buy more planes in the same haphazard manner apparently as long as the tax payers supply the dough.

WILLIS L. NYE
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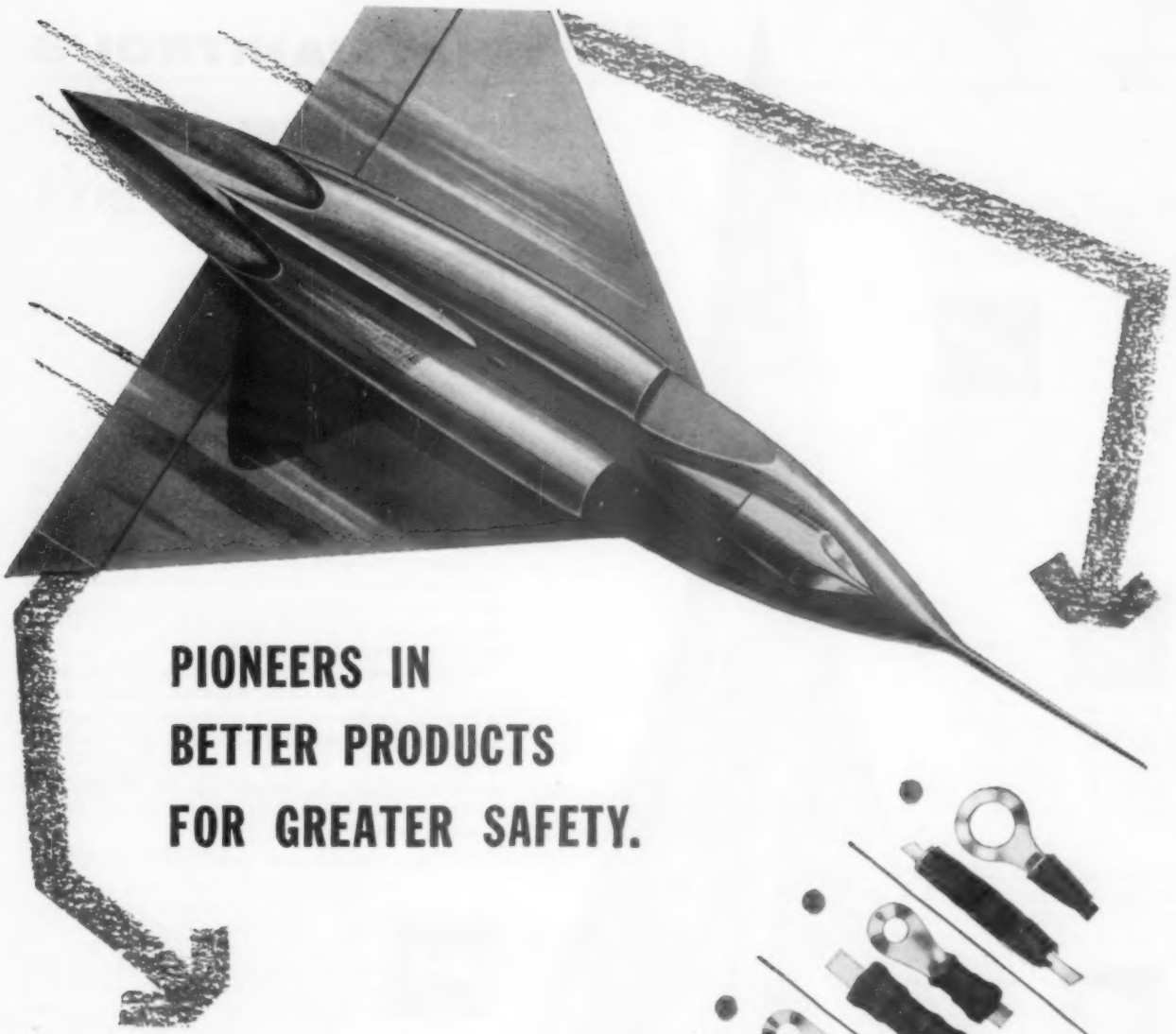
Hayward, Calif.



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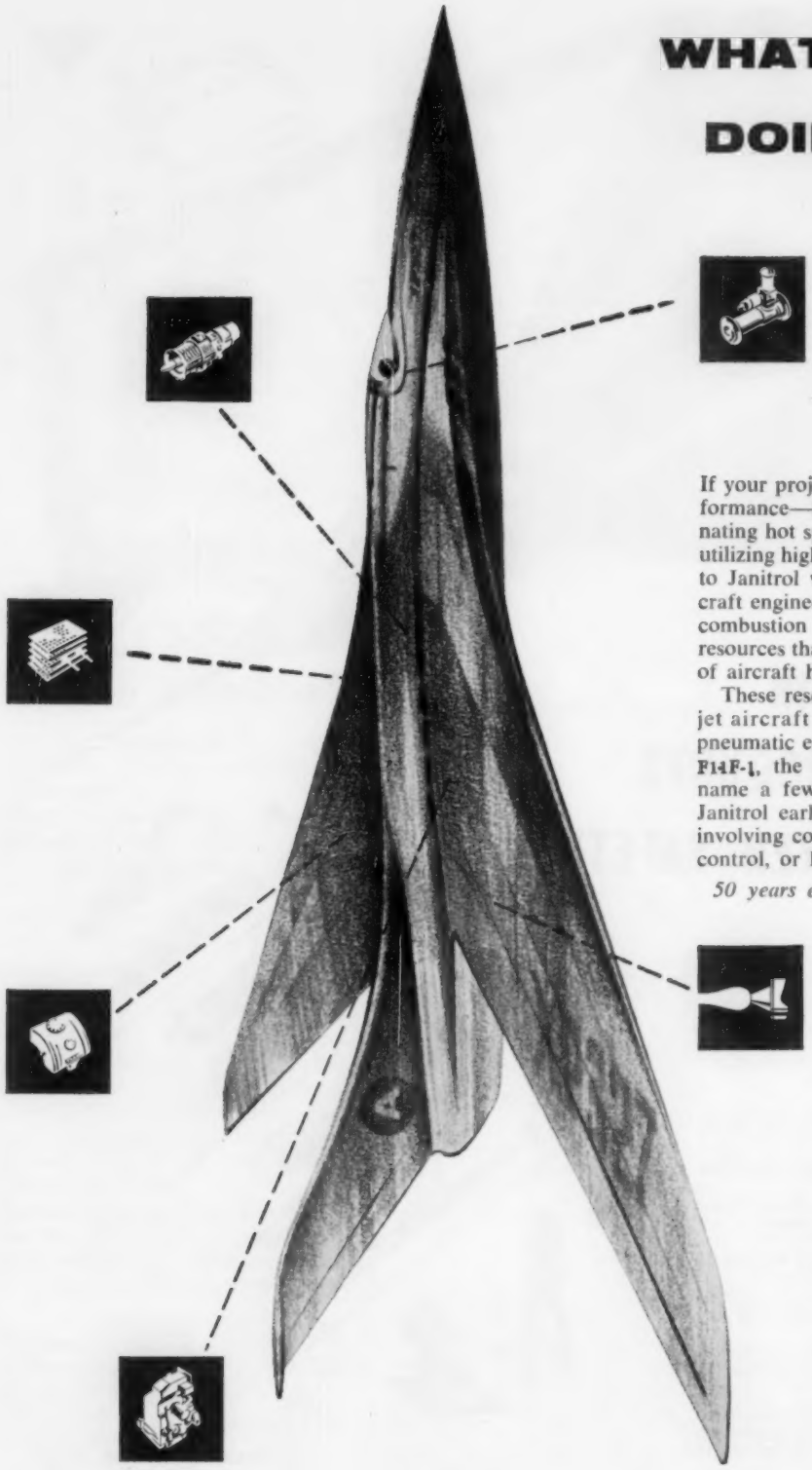

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CAB Report on Braniff Crash at Midway Airport

Fog Disrupts Approach, Plane Hits Sign

At 0624,[1] July 17, 1955, while completing an instrument approach to the Chicago Midway Airport, Braniff Airways Flight 560, a Convair 340, N 3422, struck an advertising sign located at the intersection of 55th Street and Central Avenue, Chicago, Illinois. The aircraft continued through the airport boundary fence and stopped inverted on the airport.

Of the crew of 3 and 40 passengers, the captain, the hostess, and 20 passengers received fatal injuries, the first officer and 11 passengers sustained serious injuries, and the remaining 9 passengers received minor or no injuries.

The aircraft was demolished by impact and fire.

HISTORY OF THE FLIGHT

Flight 560 is a Braniff daily scheduled flight between Dallas, Texas, and Chicago, Illinois, with intermediate stops at Oklahoma City, Oklahoma; Wichita, Kansas; and Kansas City, Missouri. On July 17 the flight crew, assigned at Dallas for the entire trip, consisted of Captain Allen R. Tobin, First Officer Orbin W. Hanks, and Hostess Mary E. Teel.

Weather Forecasts

Captain Tobin and First Officer Hanks arrived at the airport more than an hour before the scheduled departure. During this time preflight preparations were made in a normal and routine manner. The pilots were briefed and furnished the latest weather forecasts and reports over the route and for the scheduled stops.

No weather conditions of consequence were indicated except that fog was forecast for the Chicago area, and the visibility was expected to be restricted to possibly one-half mile, on arrival. Flight 560 departed Dallas on schedule at 0100.

The flight segments between Dallas and Wichita were uneventful; however, while starting the No. 1 (left) engine at Wichita prior to departure a small carburetor intake manifold fire occurred which was immediately extinguished. There was no damage incurred and the engine started easily on the second attempt. The flight proceeded to Kansas City where it landed at 0416.

As the aircraft taxied to the terminal several persons noted that the No. 1 propeller was feathered and stopped. Captain Tobin told Braniff personnel that it feathered while being returned to positive pitch after reverse thrust had been used during the landing roll deceleration. The captain unfeathered the propeller before deplaning and maintenance personnel checked it for malfunction; none was indicated. No other mechanical service was requested or performed.

[1]All times herein are Central Standard and are based on the 24-hour clock.

The aircraft was serviced to 1,000 gallons of fuel while Captain Tobin and First Officer Hanks received supplemental weather information and completed other preparations for the last segment of the route to Chicago.

VFR Departure

Flight 560 departed Kansas City at 0435 in accordance with a VFR (Visual Flight Rules) flight plan. The aircraft, according to company records, was loaded to a gross weight of 45,622 pounds. This amount was less than the maximum allowable of 47,000 pounds and the load was properly distributed with respect to the center of gravity limitations. The flight climbed to 15,000 feet m. s. l. (mean sea level).

At 0519 it requested and received an IFR (Instrument Flight Rules) flight plan for the remainder of the trip; accordingly, routine en route reports were made. This segment, as well as the previous, was described as very pleasant, smooth, and conducted primarily above or clear of the clouds.

At 0547 ARTC cleared the flight as follows: "ATC clears Braniff 560 to the Naperville Omni via Peoria, Victor 116 over Joliet, maintain at least 1,000 on top, tops reported 2,000 m. s. l., contact Chicago Center on 118.9 mc. passing Peoria." This clearance was acknowledge and the flight reported accordingly.

At 0556 Chicago ARTC broadcast a Chicago special weather observation which was: "Thin obscuration, visibility one-half mile."

At approximately 0609 the flight was asked by ARTC if it could land with one-half mile visibility and 1,000 feet thin obscuration. Braniff 560 replied that it could.

At 0611 the flight reported over Joliet, 1,000 on top, whereupon ARTC advised it to contact the Chicago Midway Approach Control. Immediate contact was made and the flight was given the same weather and the latest altimeter information.

Cleared for ILS Approach

The crew reported at 0618 over Naperville and was radar vectored by Approach Control to the outer marker for an ILS (Instrument Landing System) approach to runway 13R for landing.

At 0624 the aircraft hit the sign and crashed through the airport boundary onto the airport. Another flight, holding off the runway before takeoff, saw the wreckage stop and immediately notified the tower; crash emergency procedures were promptly initiated.

The weather conditions reported at the time of the accident were: Partial obscuration; visibility one-half mile, fog, and smoke; sea level pressure 1014.2; temperature 71; dewpoint 68; wind south 6; altimeter 29.94; remarks, fog .8.

INVESTIGATION

The commercial sign struck was located on the northeast corner of the intersection between 55th Street and Central Avenue where they bound the northwest corner of the Chicago Midway Airport.

The sign was mounted near the top of a steel post 11 inches in diameter and 18 feet, 2 inches high. The sign was located approximately 82 feet from the nearest airport boundary fence and 1,000 feet from the threshold lights of Runway 13R. Relative to the ILS glide path and localizer course centerlines the top of the sign was about 84 feet below and 122 feet left, respectively. The height of the sign at its location was also approximately 12 feet lower than the allowable height as determined by the obstruction clearance criteria.[2]

The glide path intersects the runway 1,600 feet past the sign. A single row of red high intensity approach lights are installed on the left side of the runway centerline and extend 1,300 feet outward into the approach area. These lights slope gradually higher toward the outward end and opposite the sign are nearly its height.

Right Wing Hits Sign

The right wing of the aircraft struck the sign about 18 inches below the top. Impact marks showed that this wing was down about 11½ degrees at this instant and the aircraft was on a magnetic heading of approximately 140 degrees.

The impact caused failure of integral wing structure just outside of its engine nacelle and the wing quickly separated upward and rearward into the right horrizontal stabilizer.

The aircraft then rolled progressively to the right as it crashed through the fence and struck several approach light installations. Nearly inverted, the aircraft slid through raised concrete runway identification markers onto the north-south taxiway where it stopped inverted on a magnetic heading of 290 degrees.

Fire broke out during this time and rapidly increased in intensity until it was quickly extinguished by airport firemen who reached the scene less than a minute after the accident.

Impact forces with the sign, ground, light installations, and runway markers were severe. They mutilated the nose section of the aircraft, caused extensive damage to the fuselage, and tore off the empennage. In

[2]In the establishment of instrument approach procedures as outlined in the ANC Manual, criteria have been developed with respect to obstruction clearance between objects on the surface and the flight path of the aircraft. In the case of ILS procedures the minimum clearance in feet is a function of the distance outward from the glide path unit. In order to adhere to the obstruction criteria the effective length of the runway may be reduced.

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3	Magnesium cleaning	W.L.G.*	Heavy-duty soak cleaner for magnesium, steel, copper, and brass.
4	Removing heat-treat scale from stainless steel; brightening heat-treated aluminum	MF Acid	Replaces dangerous hydrofluoric acid; easier and safer to handle and use; less corrosive.
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several areas the top and bottom of the passenger cabin were crushed close together, preventing several passengers from escaping until freed by the efficient efforts of the emergency personnel.

Malfunction No Factor

The investigation disclosed that the landing gear was down and the flaps were extended equally about 15 degrees when the accident occurred. Complete and exhaustive examination of the severely damaged aircraft structure failed to disclose evidence of fatigue cracking, structural failure, or control malfunction prior to impact.

The left engine was free of impact or fire damage. Its combustion chambers, oil and fuel screens disclosed no evidence of malfunction or failure. The undamaged condition of the engine permitted it to be functionally tested without significant alteration or repair. The results of the tests indicated normal operation.

The right engine was separated from its nacelle and extensively damaged. Its propeller shaft, nose case, and front accessory case were separated from the engine near the forward support plate. Disassembly of the engine and subsequent examination did not disclose evidence of operating distress, malfunction, or failure before the initial impact. Areas of fire damage were clearly those caused by fire following impact.

The shim plates of the left and right propellers bore impact markings which indicated that both propellers were in positive pitch and positioned about 38 degrees.

Measurements of the propeller governor speeder spring racks showed that governors of both propellers were set for about 2,400 engine r.p.m. This evidence indicated that both engines were developing nearly equal power at impact and the amount was normal for the aircraft during the latter portion of the approach.

Avionic Equipment OK

The radio and ILS receivers were damaged but capable of being tested without significant alteration. Test results showed that this equipment operated within allowable tolerances and indicated normal operation could have been expected before impact. Positive evidence revealed that this equipment was properly tuned to the Chicago ILS facilities. The associated cockpit indicators and flight instruments were so severely damaged that their indications could not be determined.

There were two models of the Bendix omni-mag indicators installed in N 3422. According to company and manufacturer's records the model installed on the captain's panel was an MN97-G-1 and incorporated an expanded localizer range feature. The first officer's indicator was an MN97-B and did not have the expanded range.

The instruments are designed to indicate to the pilots the position of the aircraft with respect to the ILS glide path and localizer course during an ILS approach. Bench and flight tests were conducted to determine whether or not course deflections were different between the two models.

The results of these tests showed that during the approach of Flight 560, as indicated by radar, including its position at initial impact, the indications of both instruments would have been alike and the

deflection of the captain's instrument would not be within the area affected by the expanded scale feature.

Notice of the installation of the expanded type indicator was placed in the aircraft log of N 3422 and several Braniff pilots stated that they had read and understood it.

Pertinent ground radio and navigation facilities were checked immediately following the accident and all were operating normally. During the investigation the possibility of interference affecting the performance of the ILS components was considered. Tests were made attempting to induce malfunctioning of the system by interference but these failed to produce any significant effect on it.

Lighting facilities for the approach and landing on 13R were on and set next to the highest intensity, the position most commonly desired during IFR conditions. Commercial lights and street lights below the approach zone had been turned off at daylight and were off at the time of the accident.

Control Tower Advisories

A regular crew was on duty in the Chicago Midway tower, located about one mile east of the accident scene. In accordance with normal procedure the approach controller gave advisories to Flight 560 during the ILS approach.

Such advisories are for the purpose of giving the pilots their position as observed on radar relative to the glide path, localizer course, and distance to touchdown. They are intended to supplement the cockpit information during an ILS approach which is made with reference to instruments. A two-way recorder made a permanent record of the advisories.

A study of these advisories, together with explanatory testimony of the controller, was a phase of the investigation. Its purpose was to reconstruct and evaluate the probable flight path of the flight as accurately as possible.

Before the approach was started positive radio and radar contact was established and at this time the flight was given the latest weather information and altimeter setting.

The radar advisories and testimony of the radar controller revealed that the flight was initially vectored onto the ILS course and was properly aligned with it before reaching the outer marker (located 5.8 statute miles from touchdown).

Advisories began five miles from touchdown and continued periodically until the flight was observed one-half mile out. In each advisory until it was 1½ miles from touchdown the flight was told that its course and glide path were good. In explanation the controller stated that he noted minor deviations but generally the ILS approach was very good.

As the flight approached and reached the 1½-mile position the controller advised, "Braniff 560 slightly left of on course, 20 feet low on the glide path . . . mile and one-half out."

The next advisory was given one mile from touchdown and again the aircraft was observed "on course, on glide path." While it approached the one-half mile point the controller transmitted, "Going to the left now Braniff 560—75 feet to the left." The aircraft reached one-half mile and he con-

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tinued, "one-half glide path good."

Following normal practice when the aircraft was observed in good position to land the controller then discontinued the advisories and turned his attention to the 10-mile radar scope preparing to give advisories to the next flight.

The controller said that his last transmission to Flight 560 ended with it correcting right toward on course. He stated, in summary, that the approach was very good and his advisories were not required. He said advisories are mandatory only when the flight exceeds certain defined tolerances relative to the glide path and course line which vary progressively commensurate with the distance from landing. He said Flight 560 was continuously well within these limits throughout the approach and at the time he discontinued the advisories.

Weather at Midway

The synoptic weather situation which existed during the trip and when the accident occurred consisted of a broad trough of low pressure which extended from Lake Erie through northern Indiana, central Illinois, and Missouri. Bounding the low pressure on the north and south were two high pressure areas. The spread between the temperature and dewpoint was narrow over the Chicago area and the terrain was moist from previous rain.

These factors, together with light surface winds, made radiation fog easily predictable for the Chicago area and it was forecast before Flight 560 originated. The fog was especially expected during the early hours of July 17.

An experienced forecaster stated that fog of this type is commonly variable in density over relatively short distances either as a result of its movement or the variable factors producing the fog. He also stated that slow dispersion of industrial smoke around the airport was another factor affecting the density of fog.

As a result weather observations were made continuously during the night and early morning hours. These reflected a gradual deterioration of the visibility until at the time of the accident it was one-half mile in fog and smoke. Thereafter, at 0655, the visibility was reported to be one-fourth mile in fog and smoke. The observations were taken approximately 1¼ mile from the accident scene and they did not incorporate the use of electronic "end-of-the-runway" visibility measuring equipment.

Under the reported weather conditions Flight 560 was permitted to land. Company minimums for the ILS approach are: Ceiling 300 feet, visibility ¾ mile. Applying the sliding scale[8] the landing was permissible with one-half mile visibility.

Accordingly, the flight was permitted to descend along the ILS glide path to the minimum altitude and if visual contact was established with the runway threshold or approach lights it could continue to descend and land. After visual contact has been established the landing may be made without further adherence to the landing sys-

[8]Operations Specifications, Part 20, par. 26 (2) (ii)
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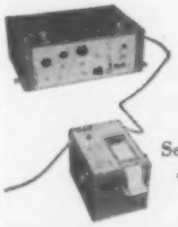

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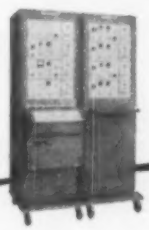

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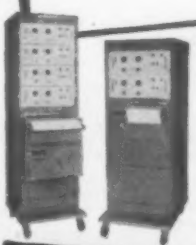

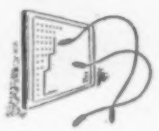

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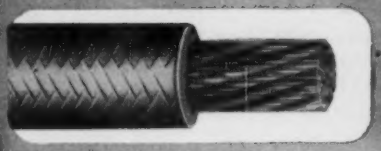

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tem. If, however, visual contact cannot be made at the minimum altitude the approach must be discontinued in accordance with the missed approach procedure.

Witnesses Testify

During the investigation and public hearing many witnesses who were located in the immediate accident area testified or gave statements concerning their observations.

Several heard the aircraft but because of dense fog could not see it until the instant it struck the sign or immediately thereafter. These persons said the approaching sound of the engines seemed normal, but judging by the volume, the aircraft seemed very low. They were not in agreement as to whether or not the sound increased or decreased with power changes, however, the most qualified said that power was reduced a few seconds before impact.

One witness who saw the aircraft hit the sign stated that it appeared, to his best recollection, fairly level at that instant.

Many witnesses offered important information concerning the fog and its density. Many on the scene when the accident happened concurred that the fog there was very dense. They pointed out that the fog density rapidly increased a few minutes before the accident, then decreased after it. They pointed out that objects only a few hundred feet from them could not be seen at the time.

Motorists stated that west of the scene the fog was quite dense and in several cases they used headlights while driving. Others approaching from the east said the fog did not hamper their driving but when they reached the immediate area visibility rapidly deteriorated until it became extremely poor.

An air carrier flight crew testified that while taxiing on the north taxiway from the terminal to runway 13R visibility became somewhat poorer but remained at least one-half mile. One crew member noted several drifting fog patches while taxiing.

A flight captain, whose flight was behind Braniff 560 and next to land, said he did not pass the outer marker inbound but recalled that he was unable to see the airport at any time. He remained above the clouds and estimated their tops to be about 1,700 feet m. s. l. He also said the fog appeared like the top of an overcast, becoming a heavy haze over the airport. While he flew in the vicinity of the outer marker he noted a few small breaks with the ground visible through them. He also stated that the ILS was functioning normally.

Passenger Testimony

The surviving passengers described the flight as very pleasant before the accident. Nearly all agreed that it was smooth and involved very little time in the clouds. Approaching Chicago several recalled that the flight descended smoothly until it was above a uniform cloud coverage. Several passengers recalled that the aircraft made several turns and then flew relatively straight for several minutes.

The early morning sun was visible above the clouds and well above the horizon. The hostess checked their seat belts and then announced the landing at Chicago would

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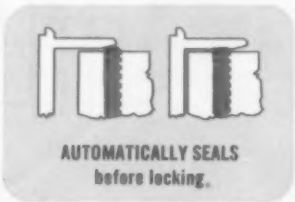
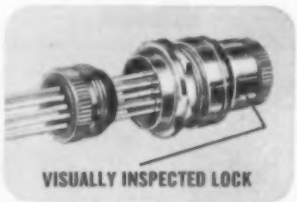
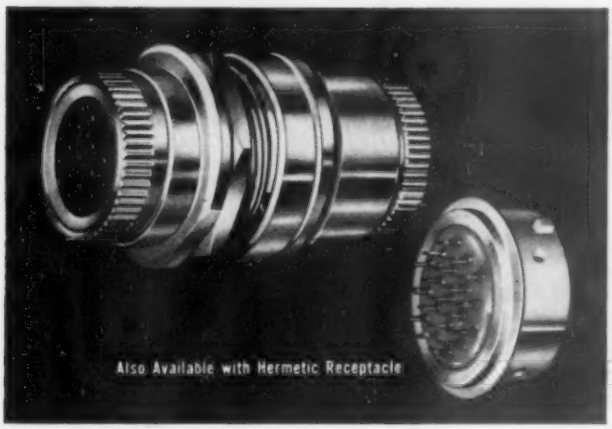
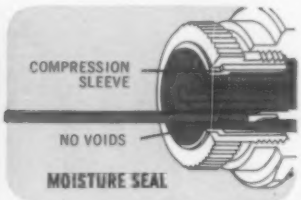
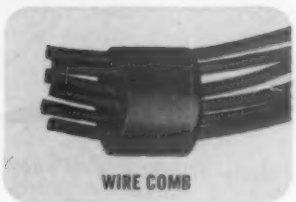
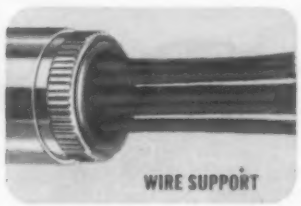


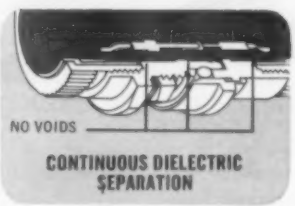


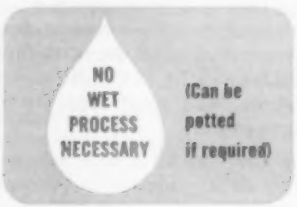










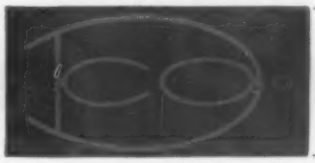


NO. CONTACTS	RECEPTACLE LENGTH	PLUG LENGTH	DIAMETER FOR BOTH
7	1⅛"	1 1/16"	1 3/16"
19	1⅛"	1 1/16"	1 3/16"
37	1⅛"	1 1/16"	1⅜"

7000 AVALON BLVD.

THE DEUTSCH CO.

LOS ANGELES 3, CALIF.



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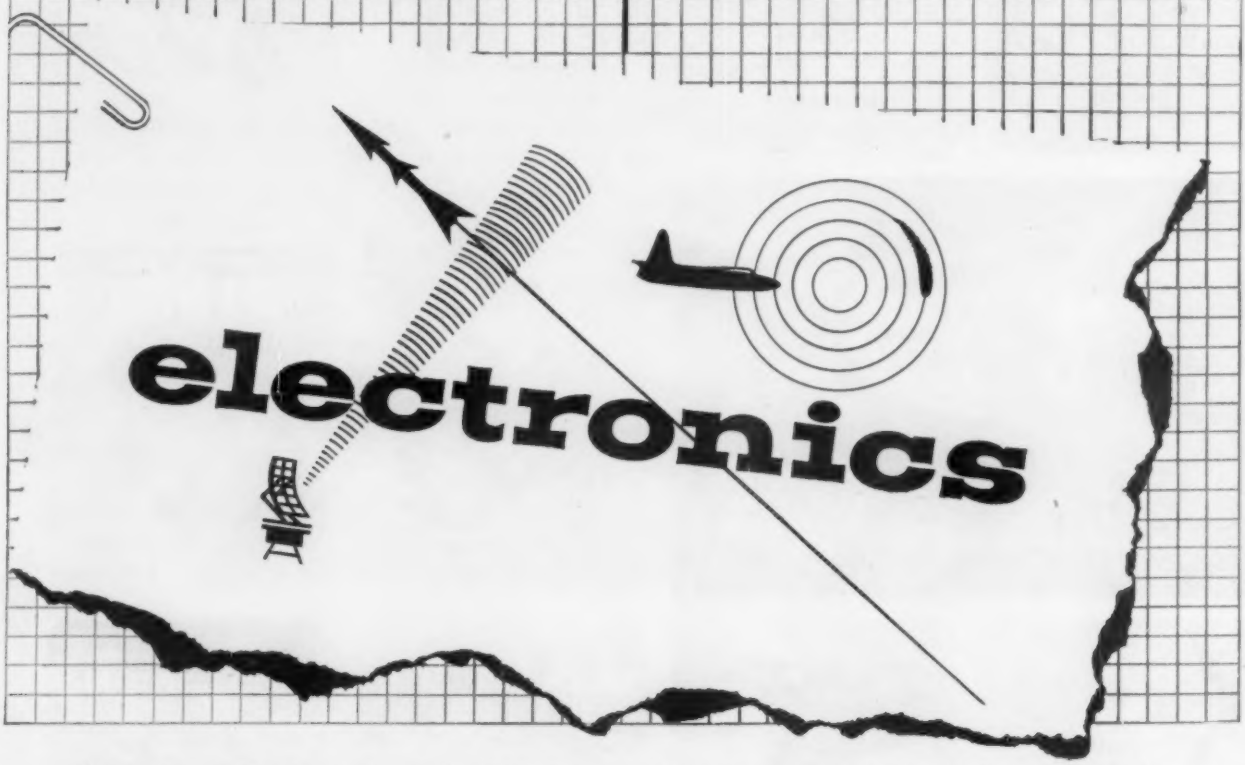

Among the challenging assignments which foretell bright futures for engineers at Goodyear Aircraft Corporation – *consider what goes on at Goodyear in the field of electronics:*

Consider "ATRAN," the all-weather electronic equivalent of a contact pilot—pioneered, patented and produced at Goodyear Aircraft. Still "under wraps" for the military – it is a device with a brilliant commercial future, *the most brilliant performer in its field!*

Consider "GEDA" – the Goodyear-built analog computer, stalwart of one of the world's largest computer laboratories—facilities readily available to creative engineers who come to Goodyear Aircraft *where you're invited to explore new avenues of approach to problems.*

Consider radomes, ground and air-borne radar, test equipment for cross-talk and deflection. And beyond the locked doors: interesting and complete challenges in the fields of missiles, weapons systems and new concepts involving electronic nerve centers.

Consider—by all means—what the future can mean for you at Goodyear Aircraft! Send resumé, request application: C. G. Jones, Personnel Department, Goodyear Aircraft Corporation, Akron 15, Ohio. Plants in Akron and Litchfield Park, Arizona.

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THE TEAM TO TEAM WITH in AERONAUTICS

be on time and in a few minutes. The aircraft began to descend again and as it entered the clouds several passengers recalled a series of left and right banks.

None recalled any appreciable power changes but all agreed the engine sound was smooth and uninterrupted.

Several passengers who were seated over the wings on both sides of the passenger cabin said that during the final descent they tried to see the ground but could not at any time.

Two others who looked down more vertically than those over the wings said they saw roof tops periodically through the mist immediately before impact. Many passengers said the descent was smooth, two however stated it seemed a little steep and one, a former pilot, said the rate of descent increased sharply a few seconds before the accident.

Crew Qualifications

The flight crew of Flight 560 was well qualified.

Captain Tobin and First Officer Hanks had 15,000 and about 9,000 hours, respectively. Captain Tobin had flown the Convair more than 1,300 hours and first Officer Hanks had flown it nearly 2,000 hours. Both pilots had extensive experience and had flown over the subject route many times. Captain Tobin and First Officer Hanks had landed at the Chicago Midway Airport 5 and 8 times, respectively, during the 30 days preceding the accident and both pilots were known to have been very familiar with the airport and its facilities

First Officer Hanks was qualified to perform an ILS approach and from the recording the captain's voice was identified indicating that First Officer Hanks was probably flying the aircraft. He, the only surviving crew member, was so seriously injured that following the accident he could not recall any details concerning it. Several months thereafter he again stated he could not remember the flight.

ANALYSIS

The available evidence indicates that Flight 560 was well planned and conducted in a normal manner until it was near a position approximately one-half mile from landing. Although two incidents occurred during the operation, one at Wichita and the other at Kansas City, it is believed that neither was a factor in the accident. Both are not foreign to air carrier operation and the left engine involved failed to indicate any evidence of malfunction.

As previously shown the sign was about 20 feet high. With respect to the ILS glide path and localizer course centerlines it was approximately 84 feet below and 122 left, respectively. It was 12 feet lower than the allowable obstruction height at that position established by the obstruction criteria.

Although the Board considers construction of the type exemplified by this sign below an approach area undesirable, it believes this accident resulted primarily because of the extremely low altitude of the flight rather than the height and position of the sign.

Analysis of the physical evidence, testi-

You have it. But it was not always that way.

Not so very long ago, an engineer struggled to obtain a degree. Yet afterwards you drove a truck. You just could not find a job that would let you utilize your hard-earned knowledge, much less start to build a career.

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We need engineers and skilled technicians. That hundreds of other companies do, too, is extremely well evidenced merely by thumbing through the pages of any trade journal. Why should you choose us above them? Perhaps you should not. Neither should you come to that decision without first becoming fully aware of our record . . . who we are, what we do, where our future lies. We would like to tell you about our company. We hope, too, that you will reciprocate and give us the opportunity to evaluate you. You can do this by writing to Mr. Richard Auten, Engineering Personnel.

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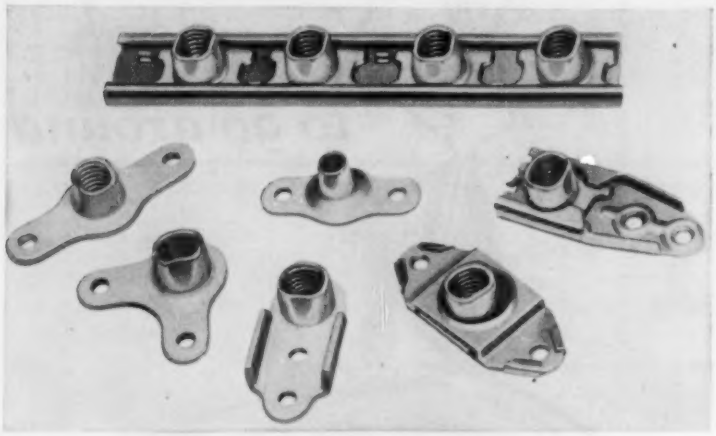
BRIDGEPORT 1, CONNECTICUT

FASTENER PROBLEM



New weight saving line of stainless steel locknuts for temperatures up to 800° F.

New aircraft designs contemplate speeds of Mach 2 and 3; missile designs push further ahead into the unexplored problems to be faced at speeds of Mach 5 and 6. Projected skin temperatures go higher and higher and in many cases pass the point where aluminum performs satisfactorily. As a result stainless steel will be specified for many of the new generations of fighters and missiles.

Fasteners, too, must be upgraded to meet the special requirements imposed by these projected speeds and higher temperatures. ESNA's solution is a new line of Type 305 stainless steel nuts designed to perform efficiently at temperatures up to 800° F; silver plated to assure a constant locking torque, freedom from galling action and a high degree of re-useability.

The new 70LH series is significantly lighter than the type of fasteners previously available for this kind of application . . . 16% lighter in some sizes . . . in others as much as 63%!

Configurations in the 70LH lines include the one and two lug, fixed and floating type anchor nuts; corner mounting type and gang channel nut strips, most of which are illustrated above. Thread sizes available in the anchor line for each configuration are 6-32, 8-32, 10-32 and ¼-28. These sizes with the exception of 6-32 also are available in the gang channel nuts.

Like all Elastic Stop nuts, those in the new LH series are self-locking, vibration-proof and high reuse is guaranteed.

MAIL COUPON FOR DESIGN INFORMATION

ESNA

Elastic Stop Nut Corporation of America
Dept. N87-1225, 2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastener information:

☐ Detail drawings of new 70LH self-locking nuts.

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

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mony of witnesses, and the probable flight path indicate the flight was well established on the ILS in the area of the outer marker.

Evidence indicates thereafter the rate of descent was well stabilized and the greater portion of the approach appeared to be executed in a nearly perfect manner. Strict adherence to the ILS during this time indicates that the flight was being flown with reference to the ILS glide path and localizer course and that the associated ground and airborne equipment were operating normally.

After passing the one-half mile from touchdown position the aircraft departed from the glide slope and descended rapidly. Considering the various factors involved this descent averaged at least 2,000 feet per minute between the one-half mile position and the sign.

It is believed that as the flight approached the middle marker the pilots probably established visual contact with the outward end of the approach lights and proceeded visually. This is the normal position where visual contact must be established for landing or the approach must be discontinued.

As near as can be determined it was approximately in this position where two passengers saw roof tops and one witness on the ground heard a reduction in power. Both observations are indicative that visual reference was being made then.

Engulfed in Fog

Without doubt the accident area was engulfed in dense fog which would limit flight visibility to near zero. It is believed that this was confined to a relatively small area and was unknown to the pilots or to ground personnel in a position to alert them.

The importance of more precise and accurate weather reporting for the normal breakout area of an ILS approach has resulted in an endeavor, for several years, to develop instruments to measure the conditions in this area. As a result "end-of-the-runway" electronic equipment is becoming available.

Visibility Measuring Instruments

The U. S. Weather Bureau has obtained 20 sets of end-of-the-runway instruments consisting of a rotating beam ceilometer for ceiling measurement and a transmissometer for visibility measurement. Installation of these instruments is being accomplished on a priority basis with high volume traffic airports receiving first consideration. As a result a ceilometer has already been installed and is in operation at the Chicago Midway Airport; the transmissometer has also been installed but was not yet in operation as of October 31, 1955.

The program for the installation of the balance of these instruments at various airports will continue during this fiscal year, with 45 additional sets programmed for the fiscal year 1957 as received from the manufacturer. The Board wishes to endorse this program and recommends that it progress as expeditiously as possible.

Based upon available evidence the Board does not believe (1) that the pilot continued below the prescribed minimum altitude without having had visual references, or that (2) as he descended visually he saw

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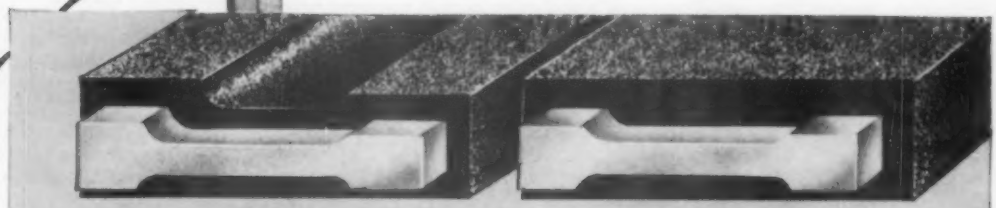
Switching to Flash Butt-Welding of Mill-Rolled Sections, Slashed Production Cost 76½%



NEW METHOD

Ring, rolled and welded from mill section of approximate shape of finished part.

OLD METHOD

Ring, rolled and welded from rectangular bar size to maximum overall dimensions of finished part.

Rough rings purchased by a well known manufacturer of jet aircraft engines weighed 135 pounds each. Most of this weight was excess metal which had to be machined away. American Welding's Industrial Products Division, working with this company, studied blueprints and recommended a flash butt-welded ring, formed from a special mill-rolled section. Adopting this new ring saved 88 pounds of metal and eliminated much of the machining time required. American Welding now produces thousands of these rings, in a rough-machined state, at less than one-quarter of the original cost.

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"FRONTIER IGNORANCE"

. . . areas into which scientific and engineering knowledge has not yet penetrated.

When Sir Isaac Newton got conked on the head with an apple, *frontier ignorance* gave way to laws of gravity. Christopher Colombo too, broke through a physical and mental *frontier ignorance* barrier on his first trip out.

The *frontier ignorance* barrier in the electronic equipment engineering field will be resolved as requirements for new electronic applications are established. We feel certain that as these barriers are pushed back by engineering ingenuity, there will be an ever increasing need for the control of the operating temperature of equipment which is yet to be designed. UAP is already in the field of cooling electronic equipment with heat dissipating systems for existing electronics.

Our original thinking applies to the dissipating of the heat which is inherent with the operation of electronic equipment. The development of more powerful and more complicated electronic systems is going to perpetuate and possibly aggravate the generated heat problem. For these problems which are yet to be created . . . we are sure that our 27 years as heat exchanging specialists will fit into penetrating the existing electronic *frontier ignorance* barrier.

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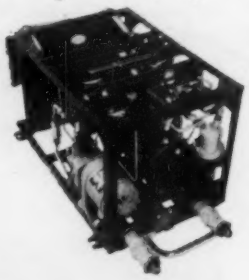
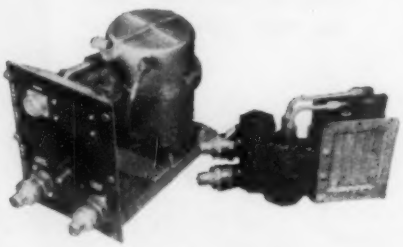


Ambient Installation



Refrigerated Air Duct Installation

UNITED AIRCRAFT PRODUCTS, INC.
1116 BOLANDER AVENUE, DAYTON, OHIO

the heavy fog before entering it.

Although it cannot be positively stated on the available evidence and without the first officer's recollection, it is believed that after visual contact had been made and the aircraft adjusted for landing the flight unexpectedly encountered the area of fog which reduced the flight visibility to zero.

During the necessary transition back to flying the aircraft by reference to instruments it is believed that the pilot experienced momentary disorientation during which the aircraft descended more rapidly before corrective action could be taken.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The company, the aircraft, and the crew were currently certificated.

2. The flight was properly dispatched.

3. The incidents which occurred at Wichita and Kansas City are not considered factors in the accident.

4. En route and terminal forecasts were adequate and before the flight originated fog was forecast for the Chicago area on arrival.

5. The flight departed Kansas City loaded to a weight less than the maximum allowable and the load was properly distributed.

6. En route reports and flight procedures were routine.

7. The reported weather conditions at Chicago permitted the flight to land and were accurately reported from the observer's position.

8. The navigational aids, the ILS components, and ground lighting facilities were functioning normally.

9. An ILS approach was made to runway 13R and was executed precisely and accurately until one-half mile from touchdown.

10. Radar advisories were furnished in a normal manner supplementing the ILS approach.

11. After approximately one-half mile from touchdown the aircraft descended at a high rate.

12. The aircraft struck an advertising sign and its supporting steel post located 1,000 feet short of the runway threshold.

13. Fog, with near zero flight visibility, enveloped the crash site over an indeterminable area.

14. Examination of the aircraft wreckage and its components revealed no evidence indicating malfunction or failure and there was no evidence of an emergency aboard the flight.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was momentary disorientation caused by the loss of visual reference during the final visual phase of the approach resulting in an increased rate of descent at an altitude too low to effect recovery.

By the Civil Aeronautics Board:
Ross Rizley
Joseph P. Adams
Josh Lee
Chan Gurney
Harmar D. Denny

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OF THE
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Pasadena, California

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2) *Inertial Guidance*

Engineers and Physicists are wanted for missile inertial guidance component development. Work involves design, development and evaluation of gyros, accelerometers, integrators, stable platform systems and associated apparatus. Particular emphasis is placed on the problem of achieving component performance under severe environmental conditions, and on development of advanced testing techniques.

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Engineers are wanted for layout design and proof testing of electronic and electro-mechanical packages with emphasis on meeting vibration, temperature, and system operation requirements.

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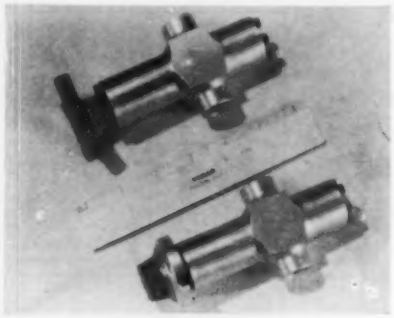


Precise Metering Valve

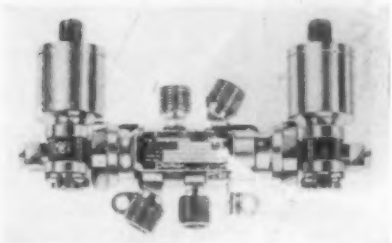
New metering and control valve operates over a wide range of flow in high-pressure hydraulic systems. A valve with ⅜-in. tubing ports will control from drops per minute to 25 gpm. at 3,000-psi. pressure drop across the valve, the maker says.

Range or ratio of maximum to minimum controllable flow can be provided up to 100,000:1. Standard operating pressure is up to 3,000 psi., but higher pressure can be provided for.

The valve permits the inclusion of a very small electric motor to provide a fully motorized modulating valve. The motor power requirement is approximately 15 w.

Bodies and internal members can be furnished in combinations of aluminum, bronze, stainless steel, alloy or carbon steels.

United Hydraulics, Inc., 110 Terrel Court, Dayton 7, Ohio.



Valve Works at 600F

New high-temperature hydraulic control valve is a pilot solenoid type operating under ambient and fluid temperatures from −65 to 600F at 3,000 psi., and able to maintain free operation at 4,000-psi. pressures. It also meets 160F specifications for weight, leakage, pressure drop, flow rate and speed of operation.

The valve, made of corrosion resistant steel with no rubber or synthetic seals to inspect or replace, has been used by Republic Aviation Corp.

Parker Aircraft Co., 5827 W. Century Blvd., Los Angeles 45, Calif.

Thermocouple Connector Kit

By stocking standard interchangeable components in various materials, thermocouple connectors for lab or plant systems can be quickly and easily assembled, it is reported.

One-piece plug and jack inserts are manufactured in four alloys (iron-constantan, copper-constantan, chromel-alumel, platinum-platinum-rhodium) for various types of thermocouples. Close contact between plug and jack is assured by a unique spring device which is not affected by vibration and maintains high tension in the unit at all times.

Plug inserts are factory-assembled in a one-piece housing and are held rigidly in place. Center spacing of points of prong makes it possible to use inserts interchangeably with all other thermocouple connectors.

Jack inserts are assembled in either a plastic housing similar to the plug housing or in a multiple connection

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Lockheed

MISSILE SYSTEMS DIVISION

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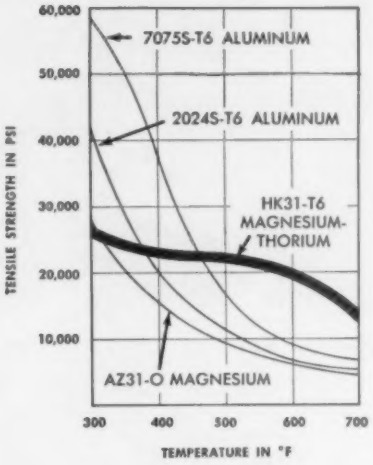
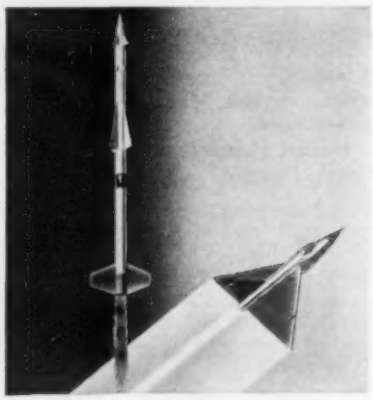
TENSILE STRENGTH AT ELEVATED TEMPERATURES



Creep Resistance at 300°-700° F.

In this temperature range, use the thorium-containing alloys of magnesium. They are the only satisfactory metals which combine creep resistance with good strength and light weight.



For designers of high speed jet planes, rockets, and guided missiles, this solves a problem. Formerly it was thought necessary to use heavy materials. They are less satisfactory than these magnesium alloys.

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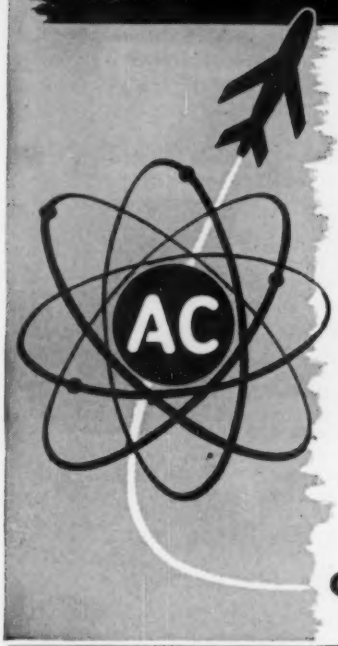

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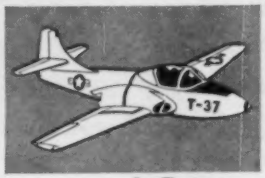

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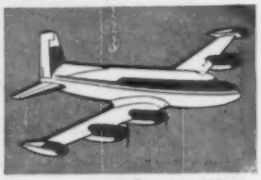

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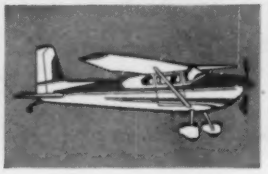

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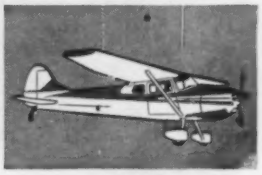

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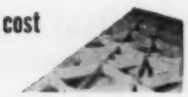

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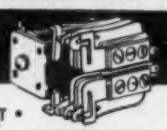

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(Continued from page 9)

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Harold J. Coleman, sales manager of Chandeysson Electric Co.

Robert S. Buritz, chief project engineer of instrument division of Thomas A. Edison Inc.

William J. Kuehl, manager of communication and navigation sub-section of General Electric's Light Military Electronic Equipment Dept. Other changes: **Russell I. Mason,** manager of airborne early warning systems and sonar sub-section; **Donald F. Uren,** manager of special project sub-section.

Robert Chase, engineering supervisor on military production jobs of AC Spark Plug Div. of General Motors. Other changes: **Leonard E. A. Batz,** chief of new design and standards section; **Theo A. Bartlett,** supervisor of new radar development group.

Ray C. Reinhartsen, general sales manager of Ekstrom, Carlson & Co., Rockford, Ill.; **Fred J. Heid,** Eastern representative to the aircraft industry; **G. R. Gordon,** Western representative to the aircraft industry.

Joseph C. Morrison, manager of engineering laboratory and development shop of GE's Power Tube Sub-Dept.

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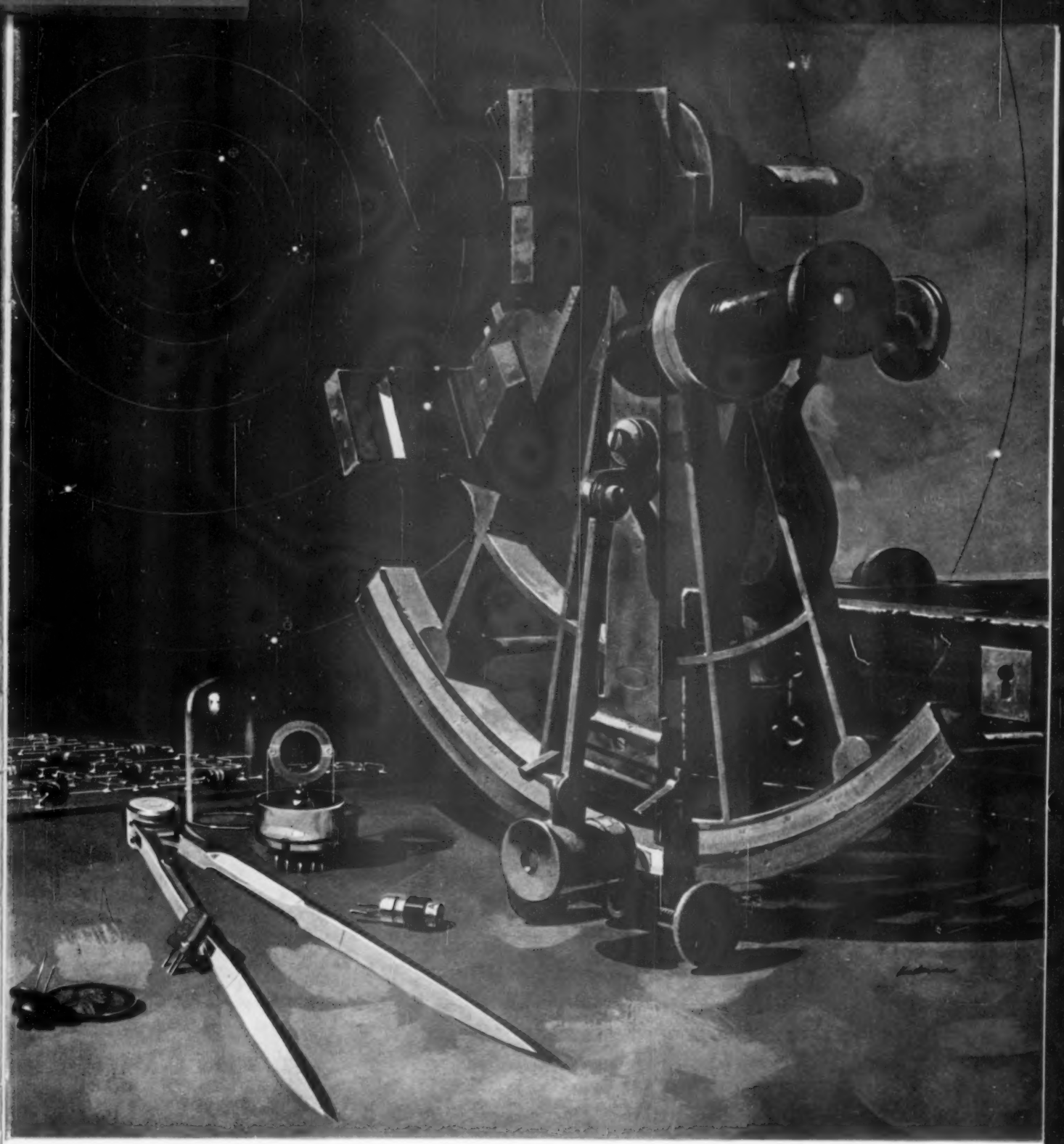
Harry B. Rottiers, director of defense contracts of Burroughs Corp.

Seymour D. Gurian, sales manager of Engineering Products Div. of Radio Receptor Co., Inc.



ON COURSE—Unceasingly, Northrop directs its progress toward development and production of the most effective weapons for national defense. Notable achievements by Northrop include Scorpion F-89 interceptors; unmanned, far-ranging Snark SM-62 A-bomb carriers; and Radioplane Company's pilotless drones and missiles. New horizons in a multitude of fields are continuously scanned by Northrop engineers and scientists, years in advance of charted goals. Working in close coordination is the well-balanced Northrop production force, thus insuring efficient, economical output. Already, the course is set by Northrop for new weapons of tomorrow, their successful production and prompt delivery assured by this coordinated effort.

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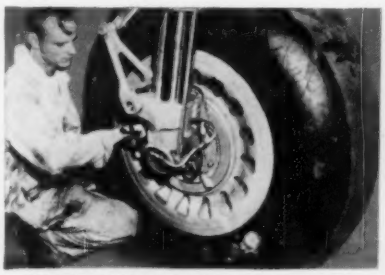
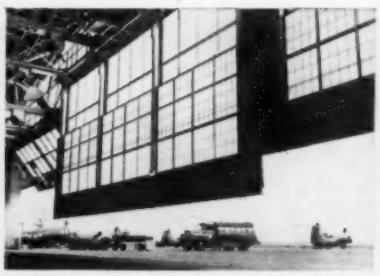


ANOTHER WAY TO REDUCE WEIGHT WITHOUT SACRIFICING STRENGTH is with Republic Alloy Steels. Weight saving effected in huge landing gear, subject to tremendous shock and strain, is a good example. Alloy steels resist fatigue. Maintain great strength at wide temperature extremes.



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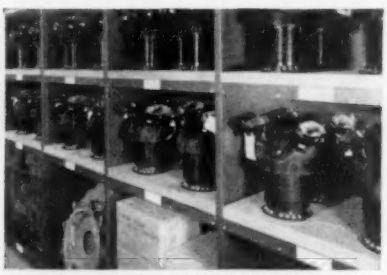

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1952 September—Orenda's production plant opens . . . the assembly line rolls. Power increased in Orenda 8 at 6,355 lbs.

1953 January—Orenda 10 replaces an American engine in Canadair Sabres.

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1955 December—Current Orendas deliver some 25% more power than first Orenda for 10% less weight. Close to 3,000 Orendas in six production models now in operation throughout the free world.

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Reaction Mixed on $80 East-West Fare

Trans World praises plan, reports 58% coach gain; United cautious over benefits, American is dubious.

By Preble Staver

Washington—Two months of scheduled transcontinental air coach services at an $80 mid-week excursion fare—the first major break in domestic air fares in five years—have produced mixed reactions from the three operators.

- **Trans-World Airlines** is most enthusiastic over the low-cost fare. A gain of 58% in coast-to-coast coach travel has been reported by TWA since it inaugurated the excursion fare of $80 each way on Sept. 12.
- **United Air Lines** is more cautious in accepting the fare as a traffic bonanza, although United credits the $80 excursion fare as having been responsible for a gain of 10% in transcontinental coach business.
- **American Airlines** is dubious that the $80 fare is good for the company and wants at least another two months to analyze its impact. The question bothering American is the amount of diversion from both first class and regular coach services.

Coach Gains 58%

TWA's inauguration of the new excursion fare was quickly followed on a competitive basis by American and United. The tariffs filed with the Civil Aeronautics Board by each carrier lists a transcontinental round-trip coach fare of $160 good on Mondays through Thursdays only within a 30-day period. All three tariffs are experimental in nature and will expire next March unless extended.

During the first two months of service, almost phenomenal traffic results were experienced by TWA. During October the airline averaged 665 coach passengers daily compared with 419 each day in October 1954 when the regular coach fare of $99 prevailed. Transcontinental coach passengers totaled 20,615 in October which was a 58% increase over the 12,989 coach passengers carried in October 1954. TWA's October traffic on Monday through Thursdays shows an even greater gain, with an 80% increase in coach traffic during four days a week over the corresponding period last year computed for an entire week.

"Most of the gain is new business and it is still growing," E. O. Cocke, TWA vice president-sales, said. He noted, however, that TWA's new multiple service Super-G Constellations also have been partially responsible.

The existence of the mixed-class, combination service by TWA is believed to have had as good an effect on traffic as the $80 fare. Since new Constellations were opened up to domestic coach passengers as well as first-class, Cocke says they have gained an average of eight passengers per day and are still gaining despite normally-slack season.

Seats Gain 33%

To accommodate increasing coach traffic, TWA has continually expanded capacity. TWA scheduled 27 daily transcontinental all-coach flights and 14 combination service flights with 20 coach seats each during October. The number of coach seats available daily in coast-to-coast service totaled 2,467. This was a 33% gain compared with October 1954 when TWA offered 1,863 transcontinental coach seats daily in operating 23 flights.

In addition to the new business created, the introduction of the $80 fare has also been beneficial in equalizing the traffic on each day of the week, Cocke said. During October 1954, the average daily coach passenger-miles were 76% of the first-class passenger-miles on Mondays through Thursdays. For the same days of October 1955, since the introduction of excursion fares, TWA's coach passenger-miles increased to 88% of first class mileage. Domestic coach passenger-miles of TWA today are 45% of the total revenue passenger-miles operated by the carrier.

United Air Lines reported a 40% increase in its coach business this year to date but does not attribute the bulk of the gain in the last two months to $80 excursion fare. B. B. Gragg, United general sales manager, said, "The $80 fare has been responsible for a gain of 10% in transcontinental coach business over what it would have been without it."

Gragg said the fare reduction has not been in effect long enough to accurately gauge its impact or judge United's experience. In addition the traffic picture for United was distorted during October by two accidents and a flight engineers strike.

However, United reports substantial gains in October with 111,647 coach passengers flying 101,397,586 revenue passenger-miles as compared with 79,607 coach passengers carried 75,783,947 miles in the same month a year ago. The percentage gains were 40% and 34%, respectively. Currently, United is operating nine daily roundtrip coast-to-coast flights.

Similar gains in domestic air coach business have been made by American Airlines, but the leading transcontinetal operator is still studying the effects of the $80 fare. An American spokesman said other analytical problems have priority over the $80 fare analysis and that it will be a month or two before a company study can be completed.

The one transcontinental air coach operator that stood to lose business by the excursion fare was the non-scheduled North American Airlines. "On the contrary," a North American official said, "we are doing better this year than a year ago. A substantial increase in traffic was realized in October when we handled 14,382 revenue passenger for 22,586,422 miles." North American acknowledged that, if it had not been for the scheduled line's $80 excursion fare its business might have even been better. However, the carrier hailed the advent of the $80 fare as a good, healthy competitive action. Today, the largest of the non-scheduled groups is operating transcontinental services with one DC-4 and two DC-6Bs providing approximately 6,278,000 seat-miles per week.

CAB Favors Extension

Activity in the long-haul coach field is under close observation by the Civil Aeronautics Board. The Board is particularly anxious to analyze the effect of the $80 coach fare within the industry. CAB officials have expressed a desire to have carriers extend fare reductions.

They would like to see reduced coach fares for 60 more pair of points.

CAB has created a powerful force to encourage the domestic scheduled airlines to lower their fares. In recent months the Board was in no position to make a demand for fare reductions since the majority of the trunk-lines went off subsidy. The decision in the large irregular case (AW Nov. 21, p. 12), makes the Supplemental Air Carriers a competitive factor in retaining the $80 fare.

An offsetting factor in favor of the scheduled lines is that the total fleet and available seats of the Supplemental Air Carriers is not large nor can this be readily expanded without great cost since the second-hand aircraft market is at an all time high.

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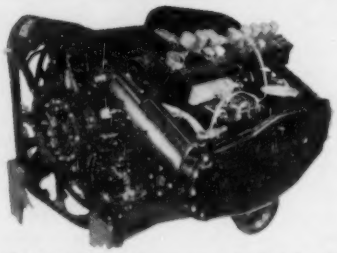
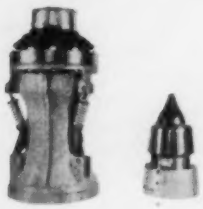


A-12 Hose Reel Unit—several hundred gallons per minute rate. Qualification test reports have been submitted to WADC. Standard U. S. Navy equipment, modification available for wing-tip mounting.

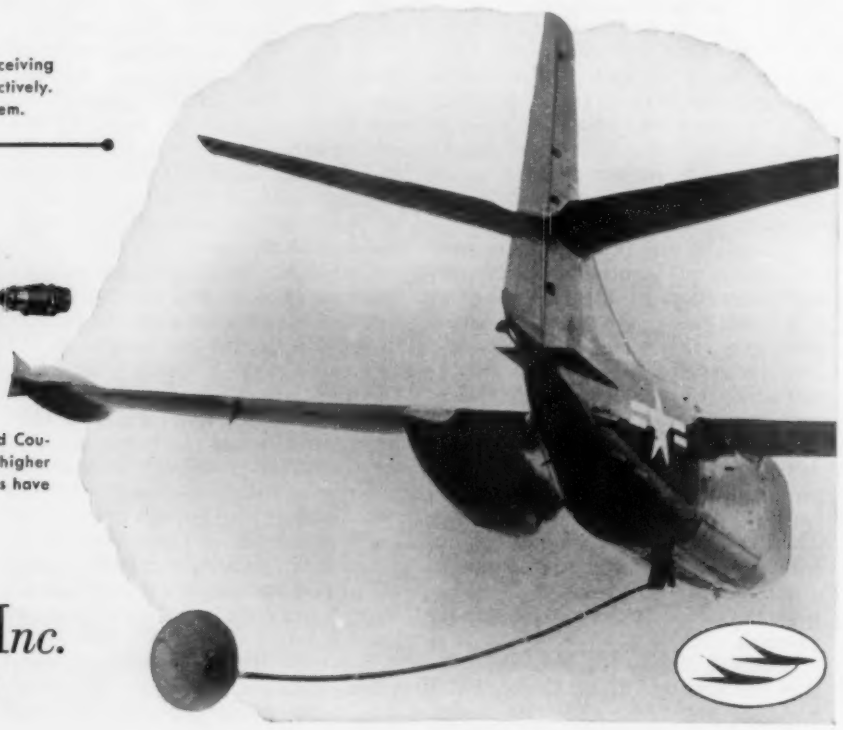


A-1 Nozzle, A-3 Coupling used in receiving aircraft and in drogue tanker respectively. In use with U. S. Navy refueling system.

MA-2 Nozzle for receiver aircraft and Coupling, mounted in drogue unit, with higher rate of flow. Qualification test reports have been submitted to WADC.

The Probe and Drogue refueling system, developed and manufactured by Flight Refueling, Inc., has been used extensively by the United States Navy. This system employs the A-12 hose reel unit, the A-1 nozzle, A-3 coupling, and drogue unit. In addition, Flight Refueling, Inc., has submitted qualification test reports to the USAF for an improved A-12 type refueling unit for multi-point tanker installation, and likewise for a refueling unit of even higher capacity. These units are already in production and will shortly go into service in aircraft of the Tactical Air Command.

Flight Refueling's engineering department is working closely with many leading aircraft manufacturers to assist them in developing new refueling systems, today's universal requirement to give modern jets extended range and load-carrying capacity. If you would like more information on Flight Refueling, Inc.'s equipment or facilities just drop a note to Contracts Administration Department.



Flight Refueling, Inc.

FRIENDSHIP INTERNATIONAL AIRPORT
Baltimore 3, Maryland

Airline Outlook

Traffic Gains Will Continue in Last Half

By Craig Lewis

Washington—Airline traffic and revenue gains made in the first half of 1955 will continue through the last half of the year on the basis of third quarter operations.

Analysts of reported results for the three quarters shows a business trend which should produce an increase of about 20% in traffic and 17% in revenue for the year. Profit margins may improve by as much as a third in the same period.

Reports of the airlines to the Civil Aeronautics Board show that the domestic trunk airlines had total revenues of $301.3 million in the third quarter. This includes $272.5 million in passenger revenues, $7 million mail revenues, $5 million express revenues and $10.3 million cargo revenues. Net operating income before taxes was $42.7 million.

International carriers had total revenues of $109 million in the third quarter. Passenger revenues were $92.9 million, cargo $7.8 million and mail $8.2 million.

Local service airlines made $15.4 million in the third quarter. The local airlines had passenger revenues of $9.7 million, mail revenue of $304,000, cargo revenue of $154,000, express revenue of $181,000 and a subsidy factor of $4.7 million.

15% Increase

Income for international airlines lagged somewhat behind average increase because of subsidy rebates amounting to approximately $5 million for the third quarter due to excessive payments and subsidy cuts made in previous quarters.

Trunkline passenger traffic in the third quarter was 5.2 billion passenger-miles, 20 million mail ton-miles, 13.9 million express ton-miles, and 44.6 cargo ton-miles. Average load factor was 62.81%.

International traffic for the same period was 1.5 billion passenger-miles, 11.8 million mail ton-miles, and 22.6 million cargo ton-miles.

Figures for the first nine months of the year indicate an increase of 15% in operating revenues for the scheduled airline industry. Net income before taxes increased 35%.

American Airlines had revenues of $195 million for the first nine months, a 26% increase over the same period last year. Net earnings after taxes were $14.3 million, compared with $5.5 million for the previous nine month period. The 1954 period included profit from aircraft sales but was also seriously affected by a month-long pilot's strike during August.

During the nine month period of 1955, American flew 3,267 million passenger-miles, a 30% increase over 1954. Cargo traffic was up 32%.

Eastern Air Lines reports gross revenues of $148.5 million for the first nine months, compared with $128 million a year ago. Net earnings after taxes were $4.8 million compared with $1.8 for the same period last year.

A 17% increase in passenger traffic is reported by Eastern. Load factor increase from 58.49% to 62.54% between the first three quarters of 1954 and the same period of 1955.

TWA Net Drops

Trans World Airlines made $163.4 million in the first three quarters, compared with $155.3 million last year. Net earnings for the period were $5.2 million, a decrease from $8.6 million for the same period last year.

TWA blames the drop in net earnings on the reductions in mail pay and expenses connected with introduction of the Super-G Constellation.

United Air Lines had revenues of $179.3 million in the first nine months, compared with $148.2 million in the 1954 period. Net earnings after taxes for the period were $10 million compared with $8.4 million for 1954.

Third quarter earnings for United were $5.7 million, less than the $5.9 million recorded for the third quarter of 1954. United attributes the decrease to the artificially high load factors in the 1954 quarter which resulted from the American Airlines pilot strike.

United flew 3,054 million passenger-miles in the first nine months, up 24% from the 1954 period. Cargo traffic increased 28%, express traffic was up 23% and mail traffic increased 15%.

Capital Gains

Capital Airlines reports revenues of $38 million for the nine month period of 1955, compared with $35.9 million last year. Net income after taxes was $4.1 million compared with $1 million in the first three quarters of 1954. The 1955 earnings include $4 million from sale of aircraft.

Capital flew 605 million passenger-miles in the first nine months. Load factor was 58.8% compared with 59.1% last year. Revenue passengers carried increased from 1,813,518 in the 1954 period to 1,946,229 in 1955.

National Airlines had revenues of $50 million in the year ending Sept. 30, 1955 compared with $40.5 million in the year ending September 1954. Net earnings for the twelve months of 1955 were $3.5 million.

In the third quarter of this year, National made $10.8 million compared with $9.2 million for last year. Net earnings increased from $65,000 for the quarter of 1954 to $468,340 for the same period this year.

National's passenger traffic was up 16.6% to 191 million passenger-miles in the third quarter this year. Load factor increased from 56.54% for the 1954 period to 61.14% for 1955.

Western Air Lines reports revenues of $23.2 million for the first nine months, up 29% from the 1954 period. Net income after taxes for the first three quarters of 1955 was $1.6 million compared with $1 million for the first nine months of 1954.

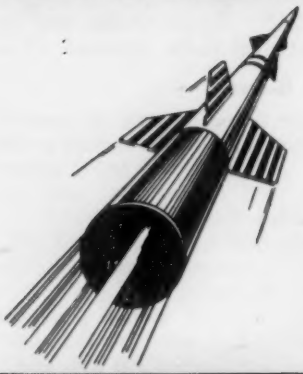
Western carried 820,000 passengers at a load factor of 60% in the first nine months compared with 607,000 passengers and a 56% load factor.

Braniff Gets High-Powered C-46

Braniff International Airways has purchased an all-cargo C-46 powered by 2,100-hp. P&W R2800-C engines after modification by L. B. Smith Aircraft Corp., of Miami. Smith is also completing tests on another C-46 for certification permitting 40-passenger operations.

THIS IS

GROUND SUPPORT !



The complex requirements of missile and piloted aircraft mean constantly stricter demands of ground support equipment. In this field, CONSOLIDATED has developed a wide range of single and multi-purpose units designed for both missiles and piloted aircraft. The compact Model 2100, for example, a self-propelled multi-purpose unit . . performs every function of electrical hydraulic and pneumatic testing . . is capable of servicing and starting guided missiles and jet air-craft quickly, surely and under the most difficult operational conditions . . . and can be used for heavy duty towing as well. It provides:

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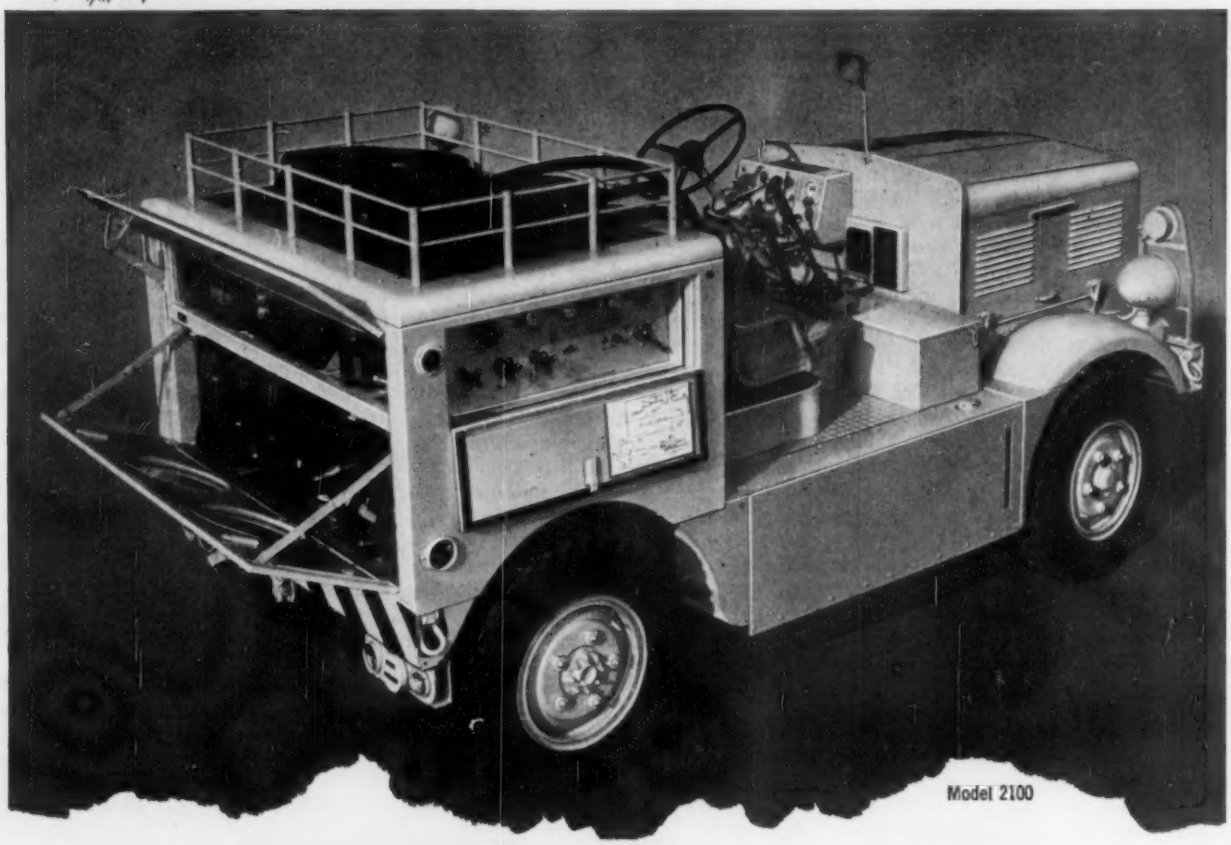

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Russian Come Down

Soviet leaders Bulganin and Khrushchev arrived in New Delhi for their state visit to India in this conventional piston-engined Ilyushin 14 airliner instead of a jet as billed. Aeroflot's transport was revealed as a converted Il-28 light bomber in Aviation Week (Oct. 10, p. 7).

Braniff Orders Five Boeing 707s

Braniff Airways last week ordered five Boeing 707 jet transports for operations on its newly-acquired routes between the Southwest, Mid-South and Washington/New York (AW Nov. 28, p. 12) and on its old Central and Southern American schedules.

Braniff's jet transports will feature combination services with 49 seats in a first-class cabin and 69 in a tourist-class section.

Separate entrances, galleys and lavatories will be provided in each cabin.

First delivery to Braniff is scheduled for October 1959, indicating that the airline expects to place the jets in service by early 1960.

Boeing says that Braniff, the third U.S. carrier to order the 707, is the "first to specify a Pratt & Whitney engine of advanced design over the J57." Obviously this is the J75, commercially designated the JT4.

Maximum gross takeoff weight of Braniff's 707s will be 248,000 lb., with a fuel capacity of 15,448 gal. Range with a maximum payload will exceed 4,000 mi.

The new jets will cut non-stop flying time from Dallas or Ft. Worth to New York in half, down to two hr. 36 min. from the present scheduled five hr. 40 min.

Other typical times for Braniff routes: Houston to Chicago, one hr., 53 min.; and Dallas to Washington, two hr., 15 min.

Charles E. Beard, President of Braniff, said the five jets will cost approximately $30,000,000, including spare engines and parts. The order is part of Braniff's $87-million program for new aircraft, which includes seven Douglas DC-7Cs. The latter will be delivered beginning late next summer.

"We have selected the most powerful engine available for our 707 jets," Beard said, "because it will provide not only the greatest speed of any jet engine but also ample reserve power to enable us to offer a dependable service regardless of operating condition."

This statement reflected Braniff's consideration for the operating problems over its high-altitude routes in South America. The 707 is capable of cruising at altitudes up to 40,000 ft.

Braniff's jets, like those ordered by Pan American World Airways and American Airlines, will be fitted with Boeing's new window arrangement, a multitude of medium-sized windows. As revealed in models of the 707 airliner, two of these windows are being installed in place of a single window of present airliners. Passengers will be able to see out of three windows, one forward and one aft of the usual window at the seat position.

Indo-Soviet Route?

New Delhi–Soviet flights bearing Prime Minister Nikolai A. Bulganin, Communist party chief Nikita Khrushchev and their entourage to New Delhi have raised speculation concerning a possible commercial air route linking New Delhi with Europe via Moscow.

The route from Moscow followed in most instances was via Tashkent, although some planes came by Ashkhabad on the Soviet-Iranian border and Termez on the Russian-Afghan border. Either route could be used to meet increasing transportation demands between India and Europe as a whole, and between New Delhi and Moscow in particular.

Under a recent agreement, New Delhi-Moscow tickets are sold on a through basis in their respective capitals, but the purchasers will make a roundabout journey: New Delhi-Bombay-Cairo-Zurich by Air India, then to Prague by Swiss Air and from Prague to Moscow by the Soviet airline, Aeroflot.

Europe's Air Meeting

The first European Civil Aviation Conference now in session at Strasbourg, France, is exploring the possibility of establishing a permanent organization.

Sponsored by the Council of the International Civil Aviation Organization, the conference will determine its future relationship with ICAO.

Other items on the provisional agenda include consideration of matters relating to the inter-change of aircraft, an exchange of views on the question of helicopter ferries in Europe, and discussions on a multilateral agreement for scheduled services and for non-scheduled services. The conference is also confronted with the necessity of fixing the relationship between itself and the Brussels Air Research Bureau.

The European Civil Aviation Conference had its beginning 18 months ago when the Council of Europe asked ICAO's help in forming a working group. A special meeting was held during April and May 1954, also at Strasbourg, which studied the pressing aviation problems in the European region.

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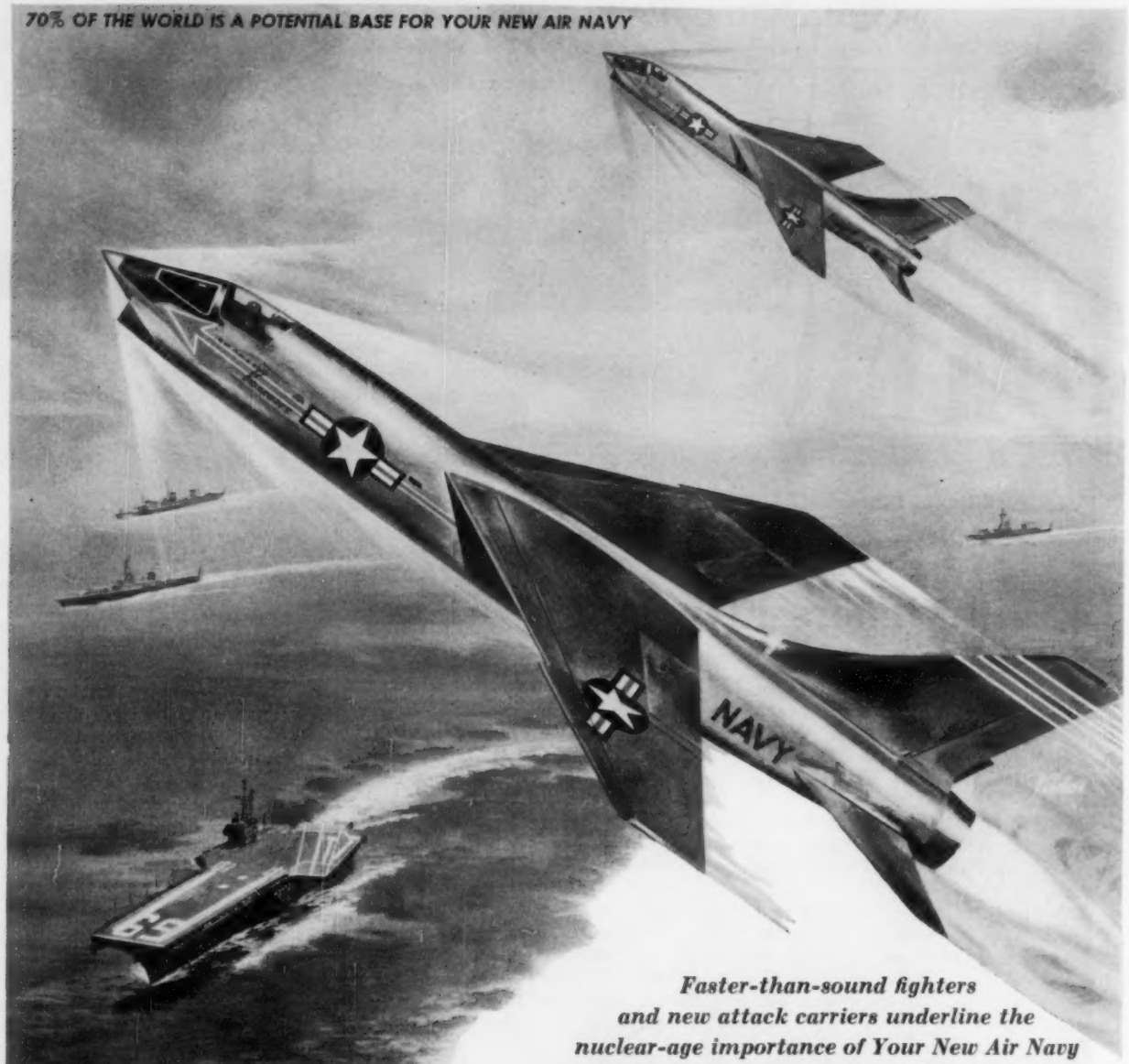

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Britannia for El Al Israel

The Bristol Britannia Mark 100 for El Al Israel Airlines, above, made the 2,230 statute-mile flight from England to Tel Aviv non-stop in 6:58 hr. El Al has ordered three Britannias.

Industry Group Checks SAGE Facility

Boston—Fifteen scheduled airline representatives toured the military SAGE installation at Deer Island near here last week for first-hand observation of the air defense system which will be linked with the Civil Aeronautics Administration operation of air traffic control (AW Oct. 17, p. 13).

Fred B. Lee, CAA Administrator, said that it was felt that leaders in the airline industry, who will assist CAA on possible plans for integration of the air traffic control and air defense systems, should have the basic knowledge of how SAGE operates as well as its components and the techniques used.

The Air Coordinating Committee has ordered an acceleration of integration plans and designated the Boston area for the first phase joint tests with the ultimate objective of establishing an all-radar airway between Boston and Norfolk, Va.

$22 Million Offset For TWA, PanAm

Trans World Airlines and Pan American World Airways have excess earnings of $22 million available to offset subsidy requirements for transatlantic services, according to Civil Aeronautics Board examiner Ralph L. Wiser.

The examiner's report covers the offset aspects of the transatlantic final mail rate case. This portion of the case was deferred for separate decision as a result of the Supreme Court finding that subsidy has to be based on all operations of a carrier, not just those of a single division.

Wiser finds that the operating divisions of Pan American have $13,490,000 in excess earnings which can be used to reduce transatlantic subsidy needs, and he finds TWA has $8,715,000 in excess earnings which can reduce its transatlantic subsidy.

The case covers the periods Feb. 5, 1946 to Mar. 13, 1947 and Jan. 1, 1951 to Dec. 31, 1953 for TWA. For Pan American, the periods are Jan. 1, 1951 to Dec. 31, 1953 for the Pacific Division, July 1, 1951 to Dec. 31, 1953 for the Alaska Division and the year 1953 for the Latin American Division.

CAB Rejects United's Ashbacker Doctrine

Civil Aeronautics Board has rejected contentions of United Air Lines that, under the Ashbacker doctrine, certain United route applications should have been included in the Denver Service Case.

The CAB statement specifically answers United's charges in the Denver case, but it also applies to similar situations in the recent New York-Chicago and Southwest-Northwest service cases.

In the Denver case, United claimed that its applications for service to Pittsburgh, Columbus, Dayton, Cincinnati, Indianapolis and St. Louis should have been consolidated in the proceeding.

The Board says that the Ashbacker doctrine, which calls for simultaneous hearing of applications for the same service, doesn't require the United applications to be considered. The Board finds that route awards made to various carriers in the three cases do not preclude the addition of Columbus, Dayton, Cincinnati, Indianapolis and St. Louis to United's transcontinental route. CAB said there is very little overlap between the United applications and the awards made to American Airlines and Trans World Airlines in the three cases.

SPAL Certificate

South Pacific Air Lines' operating authority has been renewed for a five-year period by the Civil Aeronautics Board.

With the new certificate, the carrier can fly between Hawaii and the Society Islands via Christmas Island with the provision that one flight must be operated weekly in each direction.

South Pacific is also authorized to operate irregular and charter services in an area of the Pacific Ocean which includes New Guinea and the Hawaiian Islands.

The Board found that while the airline has not started operations yet, it has made extensive preparations and should have a further opportunity to develop the route. South Pacific plans to operate with British Solent flying boats.

Delta Orders 440s

San Diego—Delta Airlines, Inc., last week ordered five Convair 440 Metropolitan Transports. The $3,475,000 sale brings the number of 440s on order to 58 and assures production of the aircraft through 1956.

Deliveries to Delta will begin next August.

Another First From Lycoming

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Latest Lycoming supercharged engine, GSO-480, will enable executive aircraft to climb higher, give more over-the-weather operation

Now from Lycoming comes the GSO-480, 340-h.p. engine . . . the first geared and supercharged engine in its horsepower class, manufactured and approved in the U. S.

Like its geared and supercharged predecessor, the 400-h.p., 8-cylinder GSO-580, Lycoming's GSO-480 makes possible greater altitude performance, more over-the-weather operation, more payload from high-altitude airports.

Such performance improvement is but one of Lycoming's continuing contributions to aviation progress.
For specific information on how the GSO-480 or GSO-580 can improve present or contemplated aircraft — military or commercial — write to Lycoming, Stratford, Conn.

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Traditionally fine performance of this executive 6-seater will be improved by its supercharged power plant —the Lycoming GSO-480

USAF, CAA Test Approach Lights

Washington—The long controversy between military and civilian pilots over approach light configurations may be resolved in a joint U.S. Air Force-Civil Aeronautics Administration test now being conducted at McGhee-Tyson Field, Knoxville, Tenn.

Purpose of the test, which began on Nov. 7 and will last approximately 90 days, is to study and resolve the problem of approach lighting at joint civil-military airports.

In order to study this problem, an installation has been made at Knoxville to permit the individual display of two configurations or both simultaneously. These configurations are in accordance with the existing national standard or centerline approach lighting system with A and B patterns.

- **Type A has a 3,000 ft.** centerline of white bar lights leading to the end of the runway. There is a crossbar 1,000 ft. from the end of the runway, marked by a green threshold bar.
- **Type B has only 2,000 ft.** of centerline lights and is red instead of white. They stop 1,000 ft. from the end of the runway with the approach clear for an "overrun area," which is marked on the right by a single line of red lights and on the left by a triple row.

In the flight testing at the Knoxville installation as many different types of civil and military aircraft as practical will be used. In addition to CAA and USAF pilots, the systems will be tested by representatives of the Air Transport Assn., the Air Line Pilots Assn., and individual airlines.

The tests, at this time, preclude any evaluation of flush approach lights such as the Dutch Elfaka flush-type. Only in the event the current tests with elevated lights fail to settle the joint-use airport problem will there be a second test. This would consist of the substitution for the elevated lights in the overrun area of such suitable flush type lighting as may be available for study at the time.

Biggest drawback to expediting tests on flush type lights is the expense. Not only is the Elfaka type fixture expensive but the installation costs have been figured as excessively high. Another problem is the maintenance. Installation and maintenance costs are high for the Elfaka runway light because the runway must be torn up, the fixture buried in a concrete box, and because the surface is a longitudinal grate it must be kept cleaned and drainage provided.

Airport lighting experts acknowledge, however, that the time may come that flush approach lights will be the requirement. They would like to see a test that would permit determination of the adequacy of such flush lights from photometric, structural and maintenance suitability viewpoints. The Air Force, particularly, has a definite requirement for flush lights and CAA officials admit they are good but both are being cautious in their approach.

Expectations are that the current Knoxville tests will result in development of a better configuration of elevated approach lighting that can be safely used by both civil and military aircraft.

The cockpit forward visibility, approach speed, and glide angle of modern high speed jet aircraft in comparison to the commercial transport differ considerably. These factors are directly related to the type approach lighting desired by pilots. A combination lighting that can be used by both type aircraft at joint civil-military airports is the objective of the tests.

Final reports from the Knoxville test by the two CAA and USAF project officers in charge will be made to Washington for evaluation and resolution by a joint committee.

Shortlines

▶ **Air France** has increased service between New York and Tel Aviv via Paris to two flights a week. Tel Aviv also has a weekly Air France Super Constellation service to Teheran and Tokyo.

▶ **British European Airways** will cut night fares to eight European cities 16% next summer.

▶ **Los Angeles International Airport** reports increases of 23% in passenger traffic and 33% in freight and express traffic for the first nine months of this year compared with the same period of 1954. The airport handled 2,562,300 passengers, 47,611,730 lb. of freight, 15,225,328 lb. of express and 26,208,233 lb. of air mail in the period.

▶ **Slick Airways** has started service to Oklahoma City with three daily flights. The cargo airline expects to open a station at Phoenix in January.

▶ **Trans-Australia Airways** gives its Vickers Viscounts major credit for the $618,965 profit reported for the 1954-55 fiscal year. Third quarter load factor for Viscount services was 85% compared with a system load factor of 70%.

▶ **Trans-Canada Air Lines** has sold three Bristol Freighters and a C-47 cargo aircraft to Central Northern Airways for $825,000. TCA has converted North Star equipment to cargo use.

CAB Orders

Nov. 17-23

GRANTED:

Mohawk Airlines an exemption to operate between Binghamton-Endicott-Johnson City and Poughkeepsie, N. Y., on Route 94, for one year.

Ozark Air Lines' application to suspend service at Chanute, Kan.

Northwest Airlines an exemption to provide free transportation to technical representatives of Lockheed Aircraft Corp. and Wright Aeronautical and Propeller Divisions of the Curtiss-Wright Corp. for in-flight observation.

Delta Air Lines leave to intervene in the Ozark Air Lines permanent certification case.

Aerovias Sud Americana an exemption to serve Managua, Nicaragua; San Jose, Costa Rica; Quito, Ecuador; and Guayaquil, Ecuador with cargo flights for one year, providing necessary authority is obtained from the foreign governments involved.

APPROVED:

Agreements involving Continental Air Lines, Delta Air Lines and various other carriers relating to their intercarrier arrangements.

ORDERED:

Effectiveness of certain amendments to the certificates of Southwest Airways and United Air Lines made in the Southwest renewal case stayed until petitions for reconsideration are disposed of.

Central Airlines issued a permanent certificate of public convenience and necessity.

Central Airlines' temporary authority covering service to various points extended effective Jan. 20, 1956.

Military exemptions for certificated air carriers, certificated Alaskan air carriers, certificated cargo carriers, large irregular and irregular transport carriers extended to Dec. 1, 1956.

Colonial Airlines' application to operate between Syracuse, N. Y., and New York City consolidated with Mohawk Airlines' application to operate nonstop between the two points. American Airlines and Capital Airlines are granted leave to intervene in the case.

DISMISSED:

Ozark Air Lines' application to overfly or suspend service at Alton-Wood River, Ill., since the point has been dropped from Ozark's certificate.

National Airlines' application to serve Varadero, Cuba, at the request of the applicant.

National Airlines' application for a new route segment between West Palm Beach, Fla.; West End, Grand Bahama, B. W. I.; and Miami, Fla., at the request of the applicant.

DENIED:

City of Charlotte, N. C., application for exemption authority for nonstop service between Charlotte and Chicago, and applications of Delta Air Lines and Eastern Air Lines to perform the service.

DOW CORNING CORPORATION

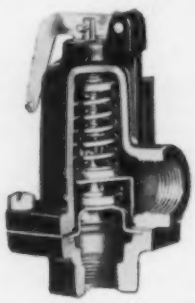
Silicone News

FOR DESIGN ENGINEERS

Dependable Valve Operation Assured With Silastic Seals

Relief valves for hot water must: open accurately at set pressure; close, drip-tight, at the slightest reduction from that pressure; give long reliable service. That's a difficult order but with heat-stable Silastic*, McDonnell & Miller, Inc. of Chicago have engineered such maximum dependablity into their new No. 230 series of pressure relief valves.

Because it has excellent resistance to moisture and to compression set at high temperatures, Silastic is ideal for sealing these devices. In the words of McDonnell & Miller, "the compressibility of Silastic provides good closure, its high temperature stability guards against deterioration, and Silastic resists adhesion, thus providing dependable operation." *No. 59*



1955 CHEMICAL ENGINEERING AWARD WON BY DOW CORNING CORPORATION

New York—An 84-man committee of senior chemical engineering educators, headed by Professor Walter G. Whitman, director of the chemical engineering department, Massachusetts Institute of Technology, has selected Dow Corning Corporation winner of the 1955 Award for Chemical Engineering Achievement sponsored by Chemical Engineering magazine.

Silicone products most widely used, are indexed by type of application, in the 1955 Reference Guide to Dow Corning Silicone Products. A brief but comprehensive 8-page summary is given of the properties and applications. With increasing effort devoted to product improvement and cost reduction, such a reference guide to this remarkably stable group of engineering materials becomes increasingly important to design engineers. *No. 62*

Silicone Insulation Eliminates Need For TEFC Motors in Tidelands Oil Operations; Saves $3,000 per Unit

In the dark ages before silicone insulation was developed, it was standard practice to specify TEFC motors in outdoor installations where excessive moisture, weathering or corrosive chemicals limit service life. Now progressive engineers are finding that open-type motors insulated with Dow Corning Silicones are equally effective and substantially less expensive.

A typical example of good modern practice is the silicone insulated compressor motor operating on one of the California Company's fixed oil well platforms in the Gulf of Mexico. Built by Electric Machinery Mfg. Co., Minneapolis, this 300 hp, 900 rpm induction motor is exposed to the most severe weather the Gulf can produce. Installed 10 months ago, the unit is in excellent operating condition.

The windings of this "Sil-Clad" motor are insulated with Dow Corning silicone resins, silicone resin-impregnated components, and a tape made with Silastic*, Dow Corning's silicone rubber. Outer protection is provided by a steel housing with a baffled ventilating system that prevents dust, moisture and chemicals from lodging in the motor. The housing and motor frame are coated inside and out with a silicone based paint formulated by Midland Industrial Finishes Co.

According to Electric Machinery, this "Sil-Clad" motor is more reliable and more resistant to corrosion than conventional Class A or B totally enclosed, fan cooled motors of the same rating. And it cost $3000 less than a comparable TEFC motor built with ordinary insulating materials. Lower initial costs combined with greater reliability and lower maintenance costs account for the rapidly increasing market for such motors. *No. 60*

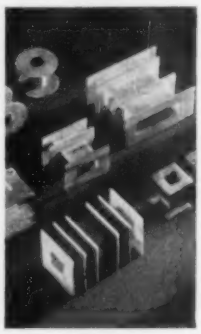
*T.M. REG. U.S. PAT. OFF.

New Silicone-Glass Insulators Meet Class H Specifications, Are Stronger, Easier to Use

Production methods developed by Silicone Insulation, Inc., New York City, reduce the cost of molding one-piece silicone-glass laminated coil bobbins and other Class H components. Users save assembly costs.

In the bobbins, glass cloth impregnated with Dow Corning 2104 silicone resin flares out from the cores into flanges providing completely unified structures that are easy to handle for quick assembly, and exceptionally strong in proportion to their wall thickness. Tolerances may be held as low as ± .001".

Neither brittle nor flexible, these one-piece laminated Class H bobbins show no tendency to break at the joints, crumble or delaminate. Already in use by several leading manufacturers of high temperature transformers, relays, solenoids and controls, they are available in a wide range of sizes and dimensions, and may have as many as six integral flanges.



Price-wise, silicone-glass laminated bobbins compare favorably with conventional Class H assemblies. Low mold costs permit production runs of as few as one hundred parts. *No. 61*

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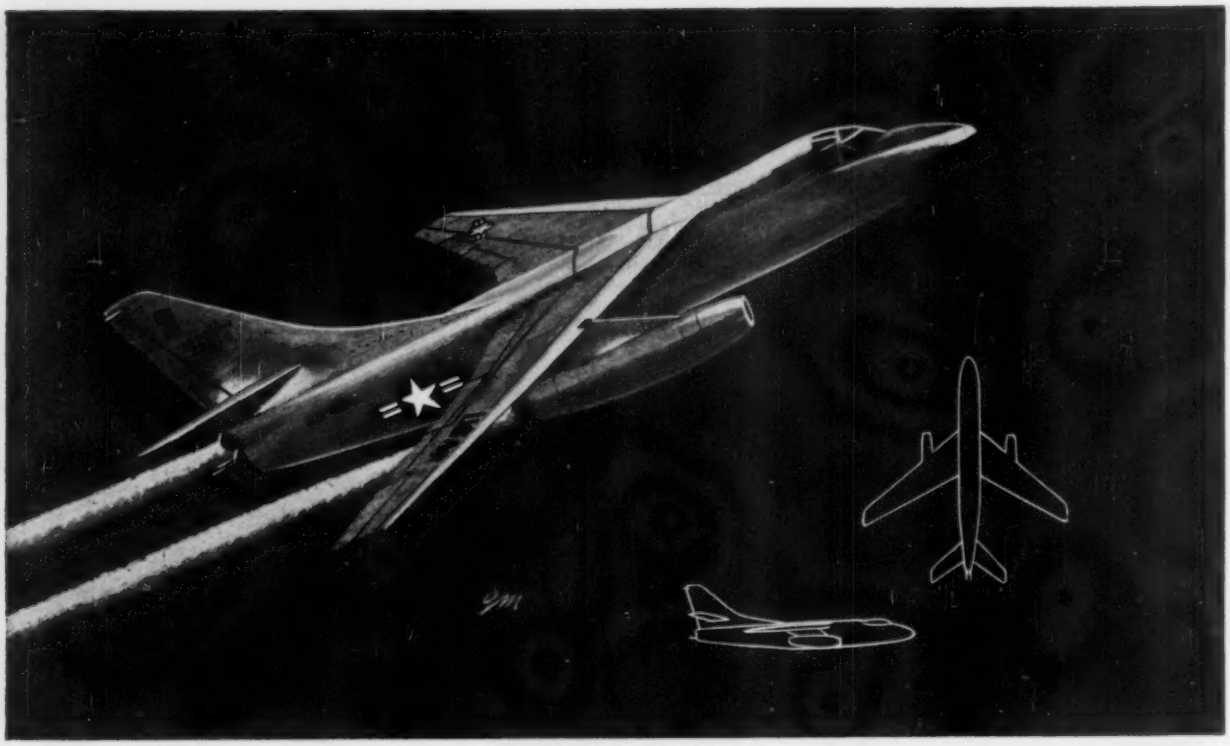
Airline Traffic—Third Quarter 1955

	Revenue Passengers	Revenue Passenger Miles (000)	Revenue Passenger Load Factor	U. S. Mail	Express	Freight	Total Revenue Ton-Miles	Per Cent Revenue Available Ton-Miles
DOMESTIC								
American	1,927,091	1,176,402	69.11	4,221,030	2,890,112	17,645,379	136,902,742	60.61
Braniff	410,160	154,499	60.53	455,241	375,607	886,516	16,501,490	54.57
Capital	719,647	225,719	60.50	746,053	779,603	1,030,462	24,126,863	45.38
Colonial	124,415	31,054	51.73	39,273	21,591	87,269	3,038,255	50.66
Continental	.....	61,833	53.79	185,514	78,947	327,488	6,512,794	45.77
Delta	510,758	225,800	61.53	736,252	1,671,925	199,877	24,741,707	56.84
Eastern	1,577,250	763,222	59.57	2,336,955	1,404,198	3,471,805	84,380,802	46.47
National	264,471	177,195	61.81	634,962	141,287	918,151	19,682,114	61.32
Northeast	223,317	44,572	63.52	34,102	56,136	120,614	4,246,019	60.06
Northwest	372,326	260,646	69.24	1,167,926	697,082	1,703,184	29,112,053	60.82
Trans World	1,045,229	839,190	69.14	3,044,046	2,182,482	6,186,406	91,742,880	62.97
United	1,586,693	1,107,810	73.93	5,700,659	3,333,047	11,483,868	126,909,834	63.08
Western	304,884	148,657	63.07	567,908	224,202	583,899	15,577,533	56.54
INTERNATIONAL								
American	35,289	25,658	76.00	34,972	1,043	605,776	3,286,287	73.45
Braniff	9,565	20,568	45.44	81,860	.....	204,834	2,605,980	45.67
Caribbean Atlantic	34,628	2,674	56.57	2,801	.....	8,107	254,186	53.21
Colonial	9,582	7,417	66.11	2,610	.....	11,020	806,442	70.30
Delta	13,174	15,257	51.43	21,452	.....	151,680	1,744,154	42.16
Eastern	52,628	74,023	71.10	167,650	.....	225,883	8,231,444	62.37
National	28,054	14,018	53.69	21,553	9,006	130,431	1,595,198	49.42
Northwest	30,093	62,703	63.50	2,416,598	54,661	1,753,162	10,841,657	68.61
Pan American								
Alaska	27,023	33,002	67.89	104,417	.....	1,117,261	4,512,861	56.22
Pacific	66,925	199,791	74.89	3,110,445	.....	2,933,331	26,828,699	71.21
Latin America	286,369	277,443	69.12	888,709	.....	7,646,897	34,892,870	64.06
Atlantic	287,270	370,781	69.21	2,423,425	.....	4,973,895	45,775,323	67.56
Pan American Grace	34,508	41,498	58.58	124,769	.....	690,497	5,235,159	54.71
Trans World	83,603	220,817	73.34	2,085,940	.....	2,004,460	27,098,411	73.30
United	30,510	75,732	86.74	282,217	.....	158,064	8,171,891	76.97
LOCAL SERVICE								
Allegheny	112,783	18,245	48.05	20,532	55,228	.....	1,815,865	50.44
Bonanza	30,453	6,469	42.11	9,330	6,686	13,543	643,541	40.39
Central	24,624	3,847	28.26	10,831	4,789	15,177	398,155	25.59
Frontier	16,455	4,294	49.81	14,622	8,373	58,168	491,518	59.87
Lake Central	35,743	5,255	35.29	8,602	36,364	.....	520,328	32.91
Mohawk	81,978	14,687	53.53	13,964	20,877	24,120	1,457,683	53.12
North Central	140,144	22,257	56.16	48,984	87,982	.....	2,269,786	50.05
Ozark	70,413	10,487	37.04	21,212	45,531	.....	1,046,915	37.50
Peidmont	100,622	19,586	55.13	37,123	33,617	44,920	1,988,783	54.78
Southern	44,835	7,543	41.25	24,406	35,556	.....	780,852	39.41
Southwest	79,771	15,928	60.84	17,353	16,539	27,468	1,578,473	59.18
Trans Texas	40,970	9,283	39.22	36,523	17,478	40,170	978,138	36.16
West Coast	61,680	10,840	49.55	12,367	6,325	18,847	1,016,163	49.46
HAWAIIAN CARRIERS								
Hawaiian	133,952	18,815	67.62	9,923	.....	427,166	2,146,715	57.82
Trans Pacific	65,452	8,539	59.40	2,514	114	32,318	684,021	56.24
CARGO LINES								
Aeroavis Sud	.....	.....	.....	.....	.....	1,544,726	1,544,726	46.54
Flying Tiger	6,262	9,363	87.85	.....	.....	11,641,045	12,577,307	73.33
Slick	.....	.....	.....	.....	.....	.....	.....	.....
HELICOPTER SERVICE								
New York	7,801	154	59.69	3,370	4,073	1,254	22,833	57.17
Los Angeles	1,856	57	27.01	13,231	4,926	.....	23,821	42.62
Helicopter Air Service	.....	.....	.....	7,474	.....	.....	7,474	41.90

Compiled by Aviation Week from Civil Aeronautics Board reports.



DOUGLAS B-66B

New medium bomber strikes from treetop level or 8 miles up

Designed to fly at all altitudes up to 45,000 feet, the B-66B can carry a wide variety of bomb combinations.

Thrust from J-71 engines puts the three-man twin-jet in the 600-700 mph class. And efficient power-to-weight ratio allows her to strike deep into enemy territory and return.

Douglas Aircraft Company's Long Beach Division is now producing the B-66B for the U. S. Air Force. Like other jets, the swift, swept-wing bomber has Inco Nickel and Inco Nickel Alloys at critical locations.

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Tracing the Arsonist

Pilots and operational people everywhere feel that it is impossible to over-stress the need for continued work on aircraft fire-proofing. Some of the following points may not be new but perhaps, if some of the problems are re-advertised, additional help will appear.

The perennial Number One item is prevention. This job falls, first, upon the engineers, designers and manufacturers. We must start with a good basic fireproof design where close attention has been paid to the sources of ignition and liberal use made of stainless steel, fire resistant seals, asbestos and similiar materials.

Fireproof maintenance is next. This entails early identification of cracks in lines, fittings and housings; inspection for metal fatigue and fire seal disfiguration, close fit of cowlings, inspection plates and various "doors and windows" which might provide draft and many other items.

Since we may never reach prevention perfection, we must have a good fire warning system. Today's warning systems are not doing the job. Apparently the delicate wires and sensitive contacts are too fragile to achieve the rugged reliability needed in everyday operations.

Fresh Thinking For New Ideas

Those who have worked on the problem know that the detection of fire is not a simple matter. Transmitting this information to the cockpit further complicates the issue. Without in any way underrating those presently working on detection, it seems that fresh thinking and brand new ideas may be needed here.

Because of the frailty of present units, our problems fall into three classes: 1. Warn too late, 2. Don't warn at all, 3. Turn in excessive false alarms. George Westinghouse was once scoffed at for designing an air brake that worked "backwards." Perhaps aviation needs a new approach, some "backwards" thinking on fire detection.

Fire fighting equipment is also a must and for this we use CO_2. Tests show that this is a good weapon—but we must add three provisos: 1. It must be used in the right place, (2) at the proper time and (3) in sufficient concentration.

Unanswered Questions

Many things have been learned from fire accidents in recent years. But some things we don't know. For instance, did the warning system work? and, if so, did it work soon enough? Or too soon? Also, was CO_2 discharged at the proper time, and, if so, did it reach the proper locations in the required concentration?

The recent Convair crash at Fort Leonard Wood, Mo., is an example of such questions being unanswerable.

What is needed is CO_2 that will leave its mark for we must be able to trace its path and time of discharge (in relation to the fire) in order to have pertinent data. Why can't we incorporate a dye penetrant, or coloring agent, in the CO_2 system which would leave a tell-tale sign?

And not just for a test either. All operational aircraft should be so equipped. By such means we might learn whether CO_2 discharge preceded the main fire, whether it escaped too soon, and by what route, and many other things.

Fire in the air is a terrible thing. Everyone in aviation would welcome help on the matter. Who knows when a small and seemingly-worthless idea will provide a missing answer. So all contributions gratefully received. This game is definitely worth the candle.

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DIRECTOR OF ENGINEERING

Rapidly expanding multi-million dollar Los Angeles aircraft instrumentation firm seeks engineering head with national reputation.

Proven administrative ability foremost consideration. Must also have outstanding technical record, advanced degree and detailed knowledge of aircraft instrumentation and electronics, servo and transistor circuitry, potentiometers.

Salary open—very high, plus options and bonus.

Please give full details and photo first letter, which will be held in strict confidence.

P8540 Aviation Week
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Douglas announces...

the formation of a separate Missiles Engineering Department

Growing importance of missiles in the nation's defense has led to the separation of missiles engineering from aircraft engineering functions at Douglas Aircraft Company.

Leadership in this important field has been won by Douglas in 14 years of development and design of guided missiles for the Armed Forces. Douglas is currently engaged in eight major missiles projects, under contracts from the Air Force, Army and Navy.

Formation of the new department at Douglas opens new opportunities for engineers and scientists interested in the missiles field. Write to: E. C. Kaliher, Engineering Personnel Manager, Missiles, Douglas Aircraft Co., Santa Monica, California.

Missiles by *DOUGLAS* **First in Aviation**

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EDITORIAL

The Dam Busters

There has been some concern in British publications and Parliament over American showing of the excellent movie "The Dam Busters," an account of the breaching of the German Ruhr dams by the Royal Air Force with specially designed bombs and low level tactics.

British concern stems from reports reaching London that the film has been doctored by Warner Brothers, its American distributor, to substitute U. S. B-17 Flying Fortresses for the Royal Air Force Lancasters in the climactic scenes of the attack on the dams. One member of Parliament took the floor with this impassioned outburst:

"Is the Under-Secretary (for Air) aware that this excellent British film was made with scrupulous attention to historical detail in connection with his service (RAF) and that in the American export version it has been grossly distorted in Hollywood particularly by the introduction of a Flying Fortress into the raid sequence? Is it not shameful that the American public has not been allowed to see the correct British version?

"In the view of the importance of maintaining the good name of the Royal Air Force should not some protest be made to the American authorities because this certainly jeopardizes good Anglo-American relations?"

We recently saw the movie accompanied by an ex-RAF type who knows a Lancaster from a B-17. We were able to detect only a single two-to-three-second sequence of a B-17 crashing into woods and bursting into flame. This apparently was dubbed in by some misguided Hollywood character who wanted a little more flash and bang in a film that certainly already had all of the dramatic action that can be crammed into an hour and a half.

There is no excuse for the technically inaccurate two-second crash scene. Nor is there any excuse for magnifying this incident into something that "jeopardizes good Anglo-American relations" or calling it a "gross distortion." We would say that a good bit of the distortion in this case has been done by the worthy member of Parliament. There is not the slightest doubt in the film that the Ruhr dam attacks were made by RAF Lancasters not Army Air Force B-17s.

American audiences can rest assured that "The Dam Busters" they see is a fascinating and authentic version of this Royal Air Force epic. Full justice is done to Vickers' Barnes Wallis, designer of the special bombs and tactics, RAF Wing Commander Guy Gibson who organized the special squadron that made the dam attacks, and the stately Avro Lancaster itself. "The Dam Busters" is a fine job done in clipped British understatement with technical accuracy. Judging by the packed theater when we saw it American audiences will not be scared away by the Parliamentary charges of "gross distortion."

It is a pleasant relief to see a technically accurate film on air war such as "The Dam Busters" without the semi-hysteria of actress June Allyson playing the tearful part of a pilot's wife who wishes her husband could be on time for dinner. Such guff has marred several American films that were otherwise technically accurate and contained superb aerial photography. The slow panning of a camera over the empty rooms of the Lancaster crews that were lost in the dam attack conveys more authentic emotion than the tearful sobbings of June Allyson.

Danger Signals

Once more danger signals are coming from the Pentagon indicating that fiscal pressure and sharp pencils of the budget experts are whittling away at the foundations of American airpower. Senator Stuart Symington of Missouri, a doughty champion of airpower and of a strong national defense establishment, has sounded the first public warning that the executive branch of the Government may be preparing to welsh on its solemn promises made last summer to the people and the Congress that production of new supersonic fighters and long-range jet bombers would be accelerated to meet the growing threat of Russian developments both in aircraft and in fusion and fission weapons.

From the Pentagon comes fuzzy talk indicating that something is in the wind along the lines of a slowdown on aircraft production. This would enable the Eisenhower Administration to limit expenditures during Fiscal 1956 and come closer to a balanced budget. We can readily understand the attractiveness of a balanced budget and the political necessity for a tax cut effective in a presidential election year. But we fail to find any evidence in the international scene indicating that this is the time when national defense in general and its backbone of airpower can be safely whittled for purely partisan political considerations.

Last spring, the executive branch of the Government made strenuous efforts to suppress and distort the real meaning of the public displays of new Russian aircraft over Moscow. When finally brought to bay by the Congress and the press, Defense Secretary Wilson and the then USAF Secretary Harold Talbott promised Congress they would accelerate production of the supersonic Lockheed F-104 and McDonnell F-101 supersonic fighters and the Boeing B-52 jet bomber. Since these promises were made, USAF and the Navy's Bureau of Aeronautics also acted to reduce the development cycle for new weapons systems and accelerate their pace of research and development.

The American people have been reassured by the Pentagon promises and the genuine effort of USAF and Navy airmen to speed new weapons development. However, if it now develops that the promised increased aircraft production is being vitiated by budget stretch-outs or secret expenditure ceilings, the American people will indeed have been bilked again by the Government on the true state of the airpower that is supposed to defend them.

We urge Congress to conduct a searching inquiry into the true state of aircraft production and Defense Department expenditures. It is becoming increasingly apparent that the American people may not be able to rely on the accuracy or veracity of official statements from the executive branch of the Government on the state of their airpower. Congress must exercise its role of vigilant and aggressive watchdog over our airpower policies.

—Robert Hotz

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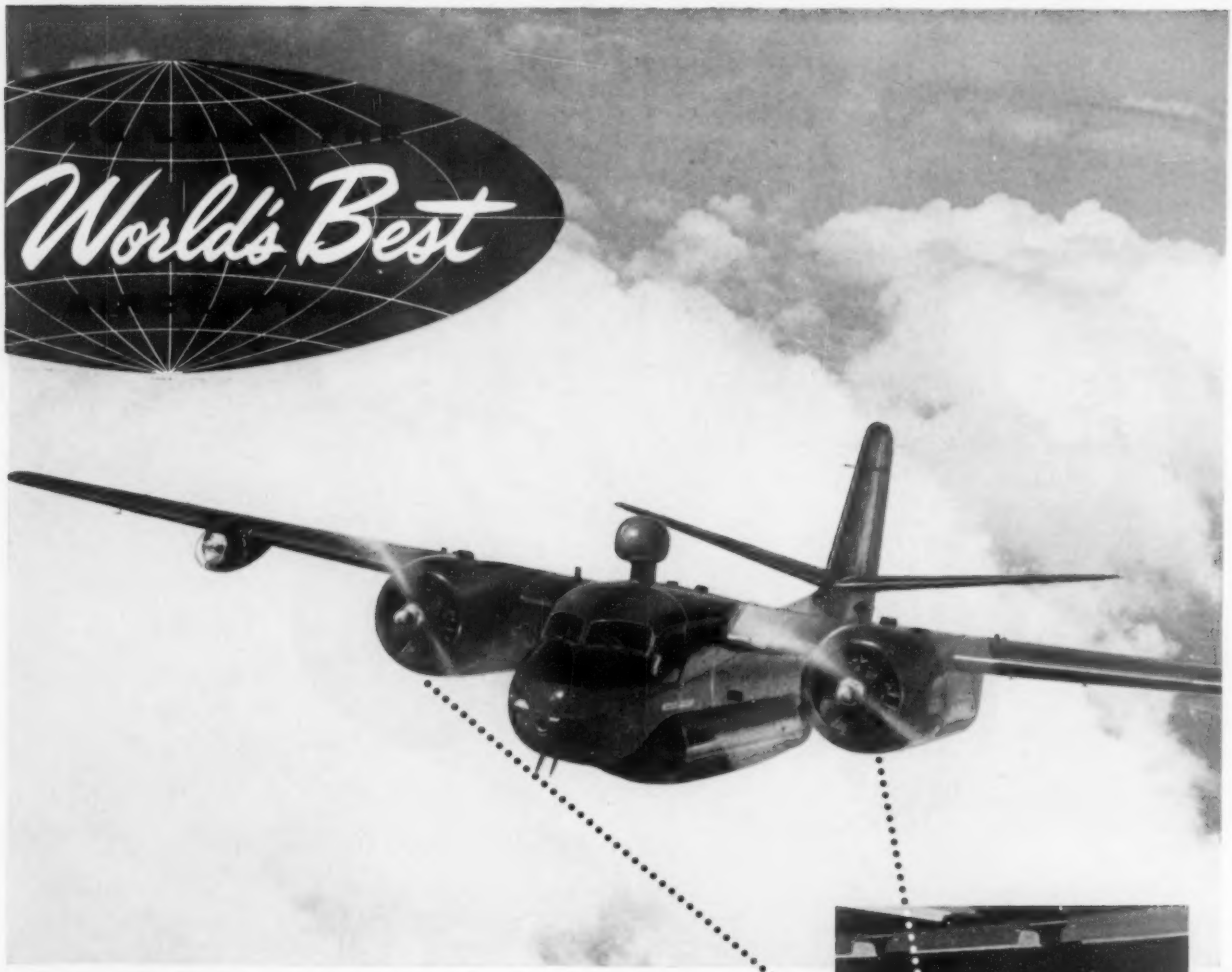

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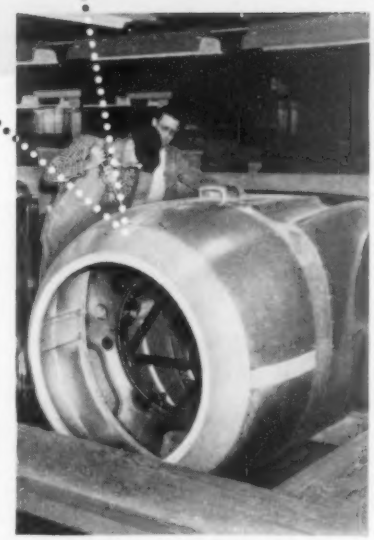

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